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PRACTICAL
POULTRY
KEEPING

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PRACTICAL
POULTRY KEEPING

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CONTENTS

PAGE
INTRODUCTION 1
CHAPTER
I LAYING THE FOUNDATION 5
II HOUSING AND APPLIANCES 11
III FOODS AND FEEDING 29
IV DRY MASH 40
V MATING UP THE BREEDING PEN 45
VI NATURAL AND ARTIFICIAL INCUBATION . . 56
VII CHICK REARING 67
VIII SEXING DAY-OLD CHICKS 77
IX SEX-LINKAGE AND AUTO-SEXING . . . 81
X DUCKS AND DUCK FARMING 89
XI GEESE AND TURKEYS 103
XII AILMENTS AND PARASITES 117
XIII TRUSSING TABLE POULTRY 135
XIV INSIDE THE EGG 139
XV BY-PRODUCTS AND SIDELINES . . . 141
GLOSSARY OF POULTRY TERMS 145
INDEX 152

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BOOK
PRODUCTION
WAR ECONOMY
STANDARD

THE TYPOGRAPHY AND BINDING OF THIS BOOK CONFORM
TO THE AUTHORIZED ECONOMY STANDARD

ILLUSTRATIONS

PAGE
White Leghorns—Male and Female 4
Light Sussex—Male and Female 4
Rhode Island Reds—Male and Female . . . 7
White Wyandottes—Male and Female . . . 7
Fold Unit 13
Battery House—Outside and Inside 15
Incubator House 17
Breeding Houses 19
Apex Ark 20
In the Trapnest House 21
Layout of Poultry Farm 21
Brooder House 22
Sun Parlour 22
Trap-Nest Front 25
Perches and Ventilating Aids . . . 27
Food Store 31
Outside Water Supply 32
Double-Sided Field Hopper 33
Dry Mash Hopper 40
Grit Hopper 43
Breeding Pen Layout 47
Small Unit Pens (Wyandottes and R. I. Reds) . . 48
Toe-Punch Marks 49
Pedigree Trays 51
Cockerel Box and Run 53
Rhode-Sussex Mated Pen 55
Broody Hen and Sitting Box 56
Range of Sitting Boxes 57
Unorthodox Egg Testing 60
Cabinet Incubator 62
Egg-testing during Incubation . . . 65
Battery Brooder Unit 66
Outdoor Brooder 66
Outdoor Brooder and Rearer 68
Oil-burning 50-Chick Brooder 69

Electric 50-Chick Brooder 69
Outdoor Brooder and Run 73
Sexing Day-Old Chicks 78
Gold and Silver Campines 81
Gold to Silver Sex-linkage 83
Black to Barred Sex-linkage 84
Auto-sexing Breeds 84
Gold Cockerels for Sex-Linkage 85
Silver Pullets for Sex-Linkage . 85
Duck Farm Lay-out 89
Apex Duck House . . 91
Portable Duck Shelter 91
Modern Duck Ranch 92-3
Khaki Campbell Ducks 94
Orchard Range for Ducks 95
Six-by-four Duck Brooder House 96
Range Water Supply 99
Aylesbury-Pekin Crosses . . . 101
Black East Indian Ducks 101
Toulouse Geese 102
Embden Geese 102
Embden Goose 104
Chinese Gander and Goose 105
Toulouse Gander 106
Buff Goose 107
Intensive Turkey House, Inside and Out . . . 111
White Turkeys 114
Turkey Roost on Range 115
X-ray Photograph of Hen's Body 119
Fowl Pox Growths 121
Tuberculosis 123
Fowl Paralysis—Varying Symptoms 125
Paralysis 129
With and Without Cod-Liver Oil 131
Administering a Pill 132
Dissecting a Hen 133
Trussing Table Poultry 137

INTRODUCTION

POULTRY culture in the United Kingdom, as well as abroad, has reached a position to-day that places it in the forefront of practical business propositions. The change during the last thirty years, gradual though it has been, has, none the less, been drastic and far-reaching.

We have passed from the theoretical Tom Tiddler's ground, where, by a simple system of calculation of so many eggs per hen, at so much per egg, less so much per week per bird for food, it could be proved that a fortune, limited only by the number of stock kept, was there for anyone to seize.

We have in its place evolved a scientific system, which, given the possession of knowledge and perseverance allied to business instinct, makes the result as incontestable as the fact that two and two make four.

Much yet remains, however, to be done, and the profits that even now await the right men will be materially augmented when as complete a system of distribution is formulated as we now have of production. Hens, after all, are economic units when properly managed, and the amount of profit varies only as their owners' skill varies. Choice of locality, choice of stock, the market to cater for, the feeding, complex in its variety according to circumstances, all these are as material as the technical knowledge of breeds and varieties.

Two Distinct Sections

It will be the aim of this book to give, in as terse and practical a form as possible, advice on these matters, so that those who contemplate taking a hand in a profitable business may not fail for want of " pointers."

Poultry culture may roughly be divided into two sections, distinct yet mutually dependent, viz., the rearing of poultry as food or as food producers, and the production of standard-bred poultry. That the former can be made profitable is beyond question, and that the latter has been made profitable can be demonstrated beyond doubt. It has been urged, with just that little bit of truth which is so dangerous, that the breeder of standard pedigree stocks is destroying the economic value of the breeds he takes up and that conversely it is the utility man who is going to come to the rescue.

Those who argue in this manner are singularly unmindful of the fact that it is to the skill of the fancier that we are indebted for the valuable varieties with which the utility man is able to court fickle fortune.

The importance of the city and suburban poultry keeper must not be overlooked. At times he has been sneeringly referred to as the "Backyarder." True, he has many limitations as a poultry-keeper, but the collective power of these poultry-keepers is enormous. World upheavals have taught us this fact. They have deserved every encouragement they have received at the hands of the Government and every effort should be made to continue to add to their numbers, rather than suppress them by various Bye-Laws.

The Town poultry-keeper has, however, no real need to keep a male bird, especially in very congested districts, and it is rather a pity to jeopardise the keeping of poultry at all—by doing so.

The skilful breeder produces a new variety which is destined only to live so long as it is an improvement on existing breeds. It pleases the public and at once the skilful breeder reaps his reward, first by winning prizes, then by selling birds at high prices. The breed becomes widely kept and, as competition increases, fancy qualities are called for to distinguish the good from the fair, the fair from the bad.

Standard-bred and Utility

All this selection and striving for beauty or form may tend gradually to decrease the utility qualities, but the utility man has no such "fads" to work for and so he is enabled to supply for many long years the regular demand of those who know how excellent a fowl the new product is. The exhibitor will always secure his profit from the price good exhibition stock commands, while the utility man will go with the tide and reach the prosperous shores in his barque.

Breeding merely for standard exhibition purposes can only be profitable when the breeder is successful, whereas the utility man is primarily dependent on the economic quality of his stock and this economic quality is secured by the proper management of proper stock.

Believing this, the main object of this book will be to endeavour to treat the subject from both aspects, and to take the uninitiated by easy stages through all the high roads and by-paths so that the complete knowledge of the world of poultry thus acquired will enable thousands of our fellow countrymen to tread with sure feet the road to success.

Before proceeding further it is timely to write that poultry breeding and production is not the simple task that has been popularly supposed. It is, in fact, a highly skilled business. As a separate entity or as part of a general farm it calls for as much forethought and planning as any other branch of livestock management. No longer, indeed, is it the Cinderella of Agriculture.

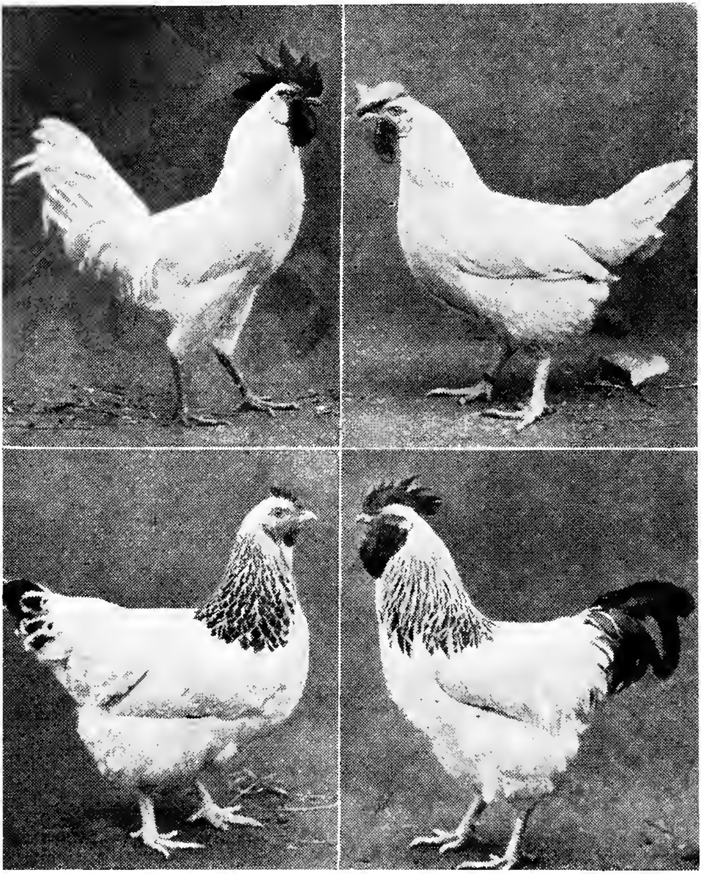
In common with other forms of livestock the intensive breeding of poultry for production has encouraged, rather than eliminated, the risk of disease. In place of the simple ailments of fowls in the early years of the present century we are now faced with diseases whose very names are almost frightening in character.

There will, of course, always be arguments as to whether poultry-keeping should form part of a general farm or whether it should remain a specialised branch of agriculture. The conclusion invariably reached indicates that no matter which way the wind blows there *must* always remain a considerable army of specialists.

Land Fertilisation

It has to be conceded that the general farmer has everything in his favour for the installation of flocks of well-bred poultry, not the least of which is unlimited land. With folds, night arks and other slatted floored appliances poultry can play a prominent part in land fertilisation and rotation of crops.

This book is being published at a time when the industry has suffered and is still suffering the severe hardships of war, and it is hoped that it will play a not unimportant part in helping to rebuild the poultry stocks of Great Britain on the sound foundations laid by breeders in the past.



Top : White Leghorns, cockerel and hen. Of Mediterranean origin the Leghorn, at one time was one of the most popular breeds in existence. It is, of course, a "light." Other varieties in the Leghorn family are—Blacks, Blues, Buffs, Barreds, Browns, Exchequers, Duckwings, Cuckoos, Reds and Piles

Below : Britain's premier dual-purpose fowl—the Light Sussex (pullet and cockerel). Originally introduced as a table breed the Light Sussex boomed immediately sex-linkage became popular. Other varieties include the Buff, Red, Speckled, Brown and White, the last-mentioned being a "sport" from the Light

CHAPTER I

LAYING THE FOUNDATION

IN the previous pages two distinct sections were mentioned—utility and standard breeding, and that which follows gives a more detailed description of what the former of these sections may be said to embrace.

Utility poultry farming is not now restricted, as is sometimes erroneously imagined, to the sole object of producing eggs and table fowls. These features must, of course, be the main object, but the poultry man cannot afford to neglect any legitimate side-lines that will keep his establishment at full work the whole year through, and at such work as will materially influence his turnover.

Establishment charges, such as rent, labour, advertising, cost of living, are more or less fixed charges which are not materially reduced by a reduction of revenue, and are correspondingly little increased by a reasonable increase in turnover. Thus the more strings the utility man has to his bow, the more will the percentage of cost be reduced over his whole concern.

Plenty of Sidelines

To the production of eggs and table fowls, therefore, the practical man will add the sale of stock birds of pure strains, the selling of sitting eggs or day-old chicks. Neither must by-products be ignored—the sale of feathers, the collection and proper treatment and sale of manure; in fact nothing that on the one hand will save money, or, on the other, produce it, must be left unconsidered.

How then must the poultry farmer lay the foundation of his business? He must decide what stock he will keep, and his choice must be governed by the markets he will cater for, public taste, and the peculiarities of his location.

Whatever saleable commodities he makes the basis of his business there is no reason why he should not specialise to a limited extent in a variety with which he might bring his name to public notice. It is an undoubted fact that success in only one breed, however unpopular or little known, materially increases the chance of selling mere utility stock of the more popular varieties.

Capital must, of course, enter into the argument, and each man must cut his coat according to his cloth, but, while avoiding a too lavish outlay at the commencement, he must start with as good stock as it is possible to procure. Reputation is one of the chief bases of success, and no man ever made a good reputation with inferior material.

Varieties known to be good egg producers must be considered if egg production is the object, likewise every effort should be made to select the best varieties or crosses when the production of table fowls is aimed at. To attempt to achieve both these objects with one variety usually leads to indifferent results on both sides. This is an age of specialisation, particularly with poultry.

Efforts have, of course, been made to produce the ideal dual-purpose fowl and some have been most creditable. Outstanding examples are provided by the Rhode Island Red and the Light Sussex. Who knows what the future holds?

All this of course is the counsel of perfection, and the nearer one is able to get to it, the greater grows the immediate prospect of a lucrative business.

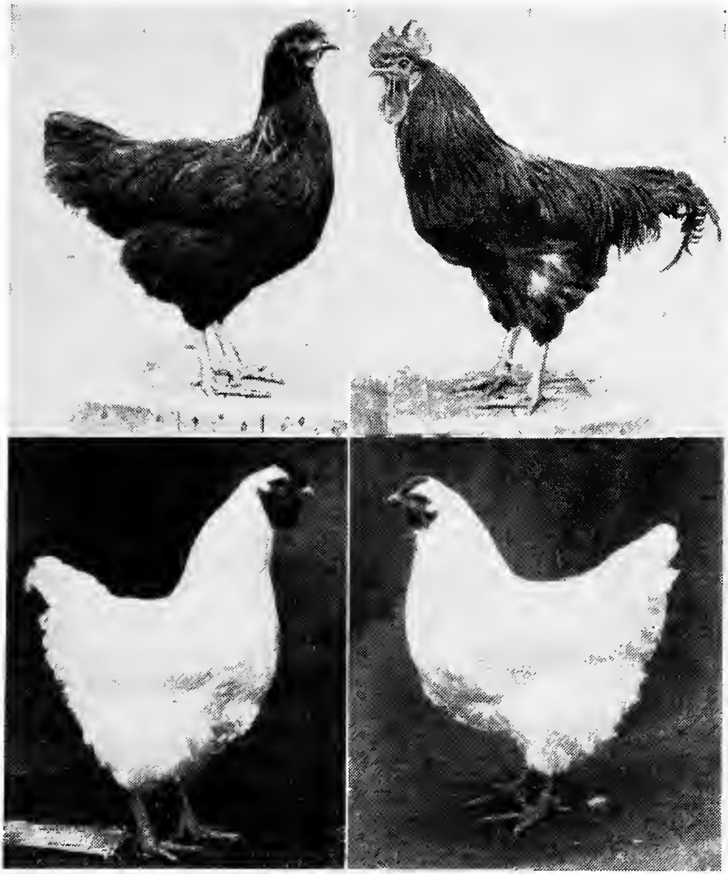
Shows as Shop Windows

Close breeding to standard in an effort to cater for the exhibition side of poultry farming is one that needs careful consideration. It must not be inferred that the income is derived from the prize money won at shows, for as a rule this only just meets the cost of exhibiting, except in extreme cases. The income is derived from the sale of exhibition stock, and the breeding of it for other exhibitors, but one must win to sell, and the shows serve as the exhibitor's shop window.

Every bird that is hatched is not an exhibition specimen, though it descends from exhibition parents. There are many sports, and mismarked specimens, because of the double-mating necessary in some cases to produce exhibition excellence. In double-mating only half the chickens, either the cockerels or pullets, are fit for breeding exhibition birds, yet mismarked specimens sell freely for egg-laying or table purposes.

It is impossible in a work of this description to treat all the varieties in detail. An exhibitor should always purchase a handbook on his variety, and a copy of the standard. It is also some encouragement to belong to a club which has the interests of the particular variety at heart.

Having considered how far our capital justifies us in going, and what objects we have in view, the choice of particular breeds is one to give anxious thought. We are presuming that outside the choice of the particular variety for specialisation we are deliberating on the other varieties which shall be the



Top : America's outstanding contribution to the breeds of poultry—the Rhode Island Red (pullet, left and cockerel, right). As with the Light Sussex the Rhode boomed from the time that sex-linkage made its appearance, and it can be said without fear of contradiction that the Rhode pushed the White Leghorn rapidly down the ladder of fame. It has also played a part in the decrease in popularity of the White Wyandotte (below). Again of American origin the White is a "sport" from the Silver-laced Wyandotte. Other colours in this family include Buffs, Columbians, Partridges, Reds, Gold-laced, Blues, Buff-laced and Blacks real wage-earners. There is more than one good laying variety as there is more than one good table bird, and the final choice must have regard to the soil upon which the birds are to be kept. The following table can be taken as a guide :—

SOIL IN RELATION TO BREED

Chalky Soils	Clay Soils	Town Runs (generally Ash)	Dark Loam or Peaty Soils	Gravelly Soils	
Dorking	Wyandotte	Minorca	Croad Langshan	Croad Langshan	Hamburgh
Orpington	R.I. Red	Campine	Buff Orpington	Minorca	
Sussex	Orpington	R.I. Red	Wyandotte	Bresse	Andalusian
Bresse	Plymouth Rock	Andalusian	Plymouth Rock	Houdan	Ancona
Game, Old English	Indian Game	Ancona	R.I. Red	Faverolles	Silkie
Marans	Marans	Croad Langshan	Campine	Campine	Cochin
Silkie	Redcap	Welsummer	Australorp	Polish	Brahma
	Ancona	Barnevelder	Barnevelder		

Reducing this to general terms it can safely be written that gravelly soils suit any poultry, chalky soils are very suitable for table breeds, and that yellow legged and big boned birds do best on clay soil.

The Wyandottes and Rhode Island Reds we find so prevalent in the North of England are mostly on clay land, this wet, retentive soil being a great promoter of leg colour, so that all yellow-legged birds do well on clay soil. This is a case where a natural colour is indicative of some constitutional trait that enables the breed to withstand the cold and wet.

The Sussex, a product of the south, has found its way on to many north country farms but it is generally conceded that each of the varieties in this breed prefer either light or chalky soils.

The Game Fowl does not follow the soil as much as its owners. Generally speaking, the Game fowl is liked greatly by the miners, and in any mining district there are invariably a large number of Game fowls kept. Naturally, being a white-legged fowl and a table bird, we should allocate it a place on gravel or chalk if we wished to place it under the most advantageous conditions.

Eire and Northern Ireland seem to succeed with all varieties, thus proving it to be one of the finest countries in the world for poultry keeping, almost any variety of fowls can find a congenial home there. Its soil is particularly suitable to the Rhode Island Red, Orpington, Sussex, White Wyandotte, and White Leghorn, and these breeds are eminently suitable for a country whose export trade of table poultry and eggs is only as yet in its infancy.

Popular Sex-linkage

The vast increase in the popularity of crosses has led to the production of millions of first-cross pullets every year. It is in favour of the greater number of them, particularly the Rhode x Light Sussex and the Black Leghorn x Rhode, to record that they seem " at home " under almost any sort of conditions.

Sex-linkage, a system of breeding which enables the poultry-man to distinguish between pullets and cockerels at hatching, has, of course, played an outstanding part in the growth of cross-breeding. A later chapter will deal with this branch.

While the table in the page opposite makes mention of many breeds which have yet to attain commercial possibilities, others are omitted because little is yet known of them. Outstanding omissions are the newer auto-sexing varieties from Cambridge and the White Surrey. Where a breed is mentioned it must also be taken to refer to varieties of that breed.

So far as egg production is concerned perhaps one of the most remarkable features of poultry-keeping is the manner in which breeds come and go—the most popular fowl of to-day can easily be the second best of to-morrow.

One of the most outstanding cases in this respect is provided by the White Leghorn. Thirty or so years ago practically every commercial egg farm in Great Britain relied upon the White Leghorn; in Lancashire and Yorkshire it was not possible to visit a farm without seeing many hundreds of these birds either on range or housed intensively. Suddenly the breed slumped and, in its place, came the Rhode Island Red.

No apparent reason, apart from the fact that the slump occurred almost at the same time that sex-linkage became popular, has ever been advanced. The White Leghorn is, unfortunately, one of the few "silvers" that do not lend themselves to sex-linkage.

Other minor booms have been created by the Barnevelder and the Welsummer. In each of these it was the dark brown egg that caught popular fancy. Latterly the Maran has stolen the limelight because of the colour of its eggs, yet it is strange that the Croad Langshan, one of the oldest of brown-eggers, has not captured popular fancy.

Another instance where a boom can be created by accident is found in bantams. Prior to the formation of a united bantam club—the British Bantam Association—little attention was paid to the utility qualities of these miniature fowls. Suddenly it was realised that bantams possessed sterling egg producing merits and their popularity increased at a remarkable rate.

Rations Caused Boom

When poultry-men were put on rations many thousands of domestics found that two bantams could be kept on the rations granted for one large fowl. So, once again, the miniatures experienced a boom.

So matters are certain to continue and for that reason the newcomer to the industry might find that a sound plan would be not to go all out on one breed alone but to foster a promising reserve.

Finally, for what goal are we to strive, and what must we avoid? We must have a definite programme, choose the initial stock with an eye to all the advantages and disadvantages, not outrun the constable in the early stages, and devote ourselves with patience to our set plan. We must avoid fads, and, above all, avoid producing that which cannot easily be sold. We must find a market that we can supply, and supply the best that we can, and do all in our power to create a demand by judiciously advertising the wares we have.

CHAPTER II

HOUSING AND APPLIANCES

IN planning a poultry farm or even a garden outfit the three great essentials to keep in view are—(1) The saving of labour, (2) the provision of periodic " rests " for the land, so that it never becomes tainted, (3) adequate provision of houses for birds of all ages, so that none are overcrowded, and young stock especially provided for.

A southern position is desirable, and in arranging things stop to consider distances that the poultryman has to walk. Desirable features would be the incubator room near the house; the food room near the water supply; the fattening plant near the food supply and trussing room. The brooder house and chicken pen near the dwelling house and the birds requiring least attention the farthest away.

The greatest expenditure on the poultry farm will be that of housing, and it is a question that ought to be carefully considered. It is false economy to overcrowd or in any way cramp the stock, and to have the poultry house high enough for the attendant to enter easily leads to the better performance of necessary duties.

Adhere to One Type

Houses should, as far as possible, be of one type for their particular purpose, and the same type should be adhered to when extensions are made.

The list starts with the smaller type of house designed to accommodate a breeding pen, or a team of stock birds.

For a pen of eight hens and a cockerel, the house should measure 7 ft. by 5 ft., the front portion being composed chiefly of wire netting to be covered with up-and-down glass shutters. The value of these for keeping out driving rain and snow, and admitting plenty of light, cannot be overestimated.

Right along the back of the building, not more than 2 ft. from the floor, the dropping board should be placed in slots, and 6 in. over this the perches, which should also be made movable and fit in U-shaped slots at each end of the building.

The nest boxes are best fitted on the outside of the house, allowing one for every three birds.

Houses of this size are, of course, completely portable and are thus more serviceable if fitted with a wooden floor.

Another feature worth remembering is to have them off the ground on brick tiers at each corner as a precaution against rats. In bleak or open country these smaller houses are safer if " anchored " to the ground.

Laying Houses

A laying house is a house in which a large flock of birds, any number up to 1,000, are kept for laying purposes, as distinguished from those where smaller numbers are kept for breeding. A laying house requires the provision of more nests than an ordinary house, one nest to each three birds being the usual number.

Laying houses are usually fixtures and a large variety of types exist. No matter what the type, as a minimum a house should allow a hundred square feet for each 25 birds. The whole of the floor space is arranged as a scratching shed by placing the nest boxes on one side of the house and the perches on the other. Windows extend low down on the south side so that the light shines on the floor under the nests.

A shelf at one end of the building a foot or so from the floor accommodates the grit boxes and keeps grit and shell out of reach of the flying chaff and dust when the birds are indoors scratching in the winter time. These buildings are, in the majority of cases, gabled, the door being in the middle, height being over the attendant's head where it is wanted, and the house should be eight feet at the ridge and six feet at the eaves. Ventilation is ideal if it can be provided both at the eaves and ridge.

There is nothing stuffy about a house of this kind even in the depth of summer, on the other hand it is light and airy and very comfortable, and a house in which birds could be kept for weeks on end if the weather compelled it. The door in the middle is usually fixed on a hinge, in other cases it slides on runners, an excellent plan for a windy situation.

Fold Houses

The fold is included among the latest types of housing adopted for poultry. It is invaluable for use on flat meadowland and, in view of the fact that its position is changed daily or every other day, the normal space allowance is approximately 2 to 3 square feet per bird.

Folds are seen in varying designs, the simple apex type being extremely popular. Nests are fitted on the outside and the majority of folds embody a slatted-floored roosting compartment sectioned off from the run. The whole object of the fold is defeated if it is made static.

Stubble House

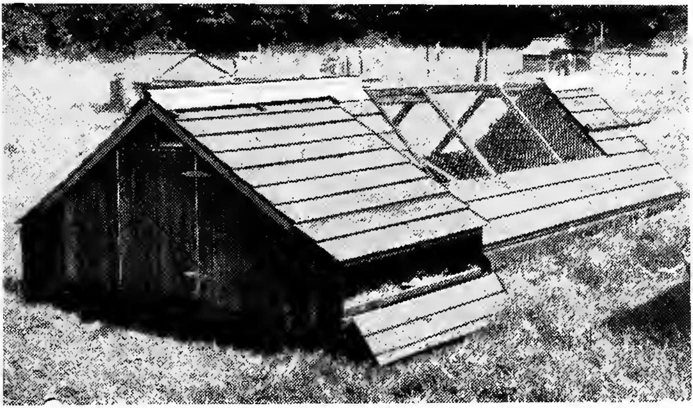
Another type of house is the stubble house, one that is indispensable to a farm of many acres. This is a substantial house on wheels, generally provided with a wooden floor. A house eight feet by six would be a capital size for twenty-five fowls. The colony house is a similar class of house, useful in dry situations, particularly for boarding out a flock of half grown chickens.

Slatted Floor Arks

These are a variation of the stubble house and are employed mainly to accommodate growing pullets, moulting hens or hens being hardened off for breeding.

Arks are used only where plenty of outside range is possible and should not, under any consideration, be regarded as suitable for intensive or semi-intensive work.

All arks are fitted with a slatted floor and this additional ventilation makes it possible to put in double or even treble



This is a popular type of fold unit embodying, if anything, a more elaborate roosting section than is usually seen. Wheels for removal are hidden by the flap of the nest-box which is shown open. Note that this box is not divided by partitions. A further box is on the opposite side.

the number of birds that would be accommodated in a solid-floored house of the same size.

Beginners should not regard the ark in the light of providing permanent accommodation. Its main purposes are those listed above and it is an excellent standby at those times when the farm is heavily stocked.

As stated above the ark is invaluable as temporary accommodation for growing pullets and, on many farms, it is employed as the intermediary between the weaning and laying stages.

Care has, however, to be exercised in transferring the youngsters to arks. A sudden change from solid to slatted floors is minimised by covering the slats with straw and leaving it there until such time as it is worked through the slats by the constant passage of birds.

Battery House

Latest of all types of housing is the battery house. This is constructed for the sole purposes of housing laying cages either in tiered rows on each side down the centre or in tiers flush with the side walls.

Here again the gable type of house is favoured and by reason of the fact that the occupants are two or even three tiers high a special feature is made of ventilation.

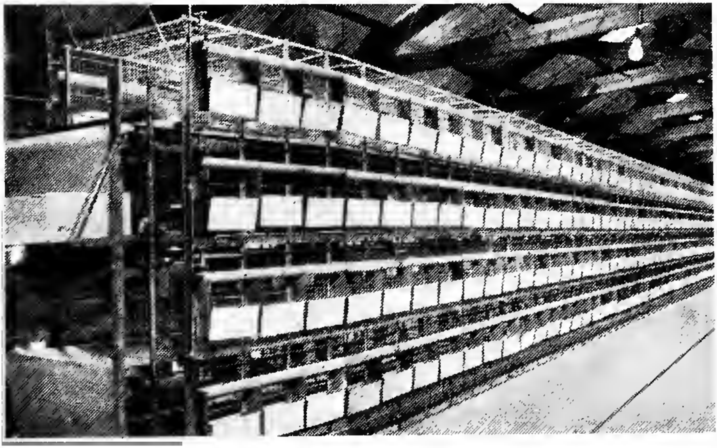
Not unnaturally this system of poultry-keeping has been criticised in many quarters on the grounds that it is departing from many accepted principles. This criticism has, however, failed to impede the spread of battery egg production. What it has succeeded in doing is to improve by leaps and bounds both house and cage design.

The term battery is questioned by many people but from its definition—a set of similar or connected cells—it is a perfectly correct title for a set of cages.

A few years ago the battery house was ill-conceived in design while the cages employed were crude and failed to lend themselves to a conservation of labour. Reference to the photographs on the opposite page should be sufficient to demonstrate the manner in which each of these early failures have been overcome.

House ventilation is, of course, of primary importance, while ease of cleaning the cages comes a very close second. Automatic fittings embodying endless felt or paper rolls pass beneath each tier of cages—hand-operated rollers at either end remove the soiled felt or paper and bring into position a cleaned section.

Battery house and equipment design has kept pace with the increased popularity of this form of egg farming. Photographs show not only a well-constructed house but also its interior. Note particularly the lighting arrangements include roof lights as well as maximum window space at the sides. Cages are fitted with individual feeders surmounted by a continuous water-trough with direct supply. Paper or felt on endless rolls beneath the cage floors trap the droppings and cleaning consists mainly of turning a handle which either brings new paper in position or scrapes the felt



Watering arrangements have also received close attention. In place of small containers covering only a cage or two is the continuous trough serving a full layer of cages, the supply being controlled either by ball-cock arrangement or by tap as seen in the lower photograph. Feeding troughs are not continuous, in the greater number of cages they are arranged singly; in the remainder one trough covers two cages.

Incubator House

The very term "incubator house" implies a structure having some particular qualifications for this purpose, which is that of the accommodation of incubators.

An incubator room, wherever it is, should be quiet, have a north window for preference, and be well ventilated; where the windows have other than a north aspect, a dark green or blue blind should be provided, or sun blinds to keep out the glare of the sun, which would run the temperature of incubators up to a dangerous point.

The floor may be either wood, stone or cement, as all three will bear a sprinkling of water during the very dry season.

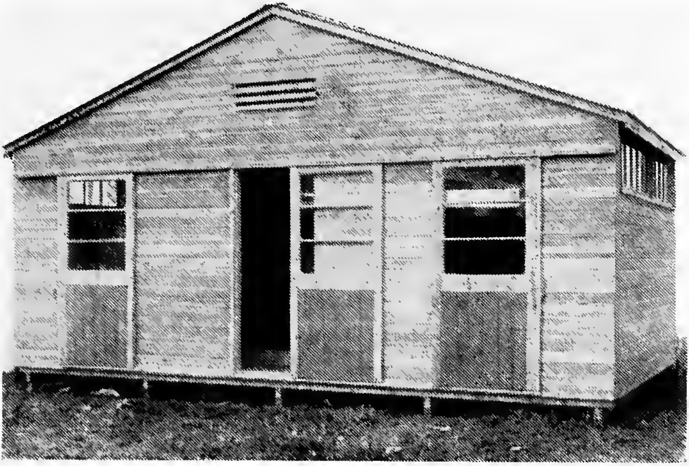
In selecting an outbuilding for an incubator room, care should be taken in choosing one with a fairly equal temperature. Much loss comes from working incubators in a cold outbuilding where the range of temperature from night to day is very great.

Temperature of the room should not vary more than 20 degrees between midnight and mid-day when the sun is shining, and a high-room-temperature is more conducive to a successful hatch than a low one. A temperature between 60 and 70 degrees should be aimed at, but the wrong way to achieve it would be to use artificial heat. It is for this reason that position is important.

Most incubator houses are lined with insulating material like Essex board or Celotex mainly for the purpose of conserving warmth and, while this description of a house and the photograph in the opposite page includes windows, many hatchers do away with windows altogether.

If a special incubator house is being built, it should stand apart from the other buildings. A sheltered position should be chosen, and again, the windows will face north. Ventilation is best provided by air shafts inside the building, from under the ridge down to the floor. Both entrances should be protected by iron grating or perforated zinc to prevent the entrance of birds or mice in the shafts. Then at each end of the building, just under the ridge, outlets will be provided, the area of which will be the same as the inlets.

Although the modern incubator is as near perfection as it possibly can be it needs housing accommodation that is exact.



One of the most important buildings on the farm is the incubator house. The photograph shows a substantially-built insulated house in which four 5,000-egg cabinet machines are run. Desirable features in such houses are : Equable temperature, foolproof ventilation and, whenever possible, windows facing north

Brooder-house

The term brooder-house is applied to a building in which a large number of chickens can be artificially reared. There are several types of brooder-houses and the method of heating also varies. In one the brooders are heated by a tubular system of hot water pipes running over the apartments in which the chickens sleep, the pipes being supplied from a centrally-situated hot water tank heated by oil, coal or electricity.

In another type the hover is arranged either curtain or otherwise to confine the heat and radiate it on to the chickens' backs. The hovers are made larger and larger as they recede from the lamp so that they become cooler and cooler and the chickens can be moved week by week or otherwise according to the number of compartments.

A brooder house facilitates the rearing of chickens enormously, as a house 25 to 30 feet will accommodate a thousand chickens and occupy little more time in attending to them than a single outdoor brooder with a hundred chickens.

In the second type the hover is heated by an oil lamp or gas jet in the centre of the hover and protected by a gauze or wire netguard.

In a further type a large stove, usually burning anthracite, is used and flocks of 250 to 1,000 or more chickens run together. From 250 to 500 are perhaps the safer limits to run in this type of brooder.

Electrically heated battery brooder houses, in most of which the heat is thermostatically controlled, are found on up-to-date farms. Most of them carry chicks in batches of fifty to a hundred in each of the several compartments.

Colony House

The colony house should be a substantial building as it may have to stand a good deal of weather in an outlying portion of the farm. Colony work implies keeping the birds in small flocks, perhaps 25 or 50, distributed in various convenient spots about the farm. On a 200- or 300-acre farm it is undoubtedly the system to follow. The house should be on runners or wheels, and of suitable width to go through any gateways that will have to be encountered. Colony houses are extremely useful for "camping out" a lot of half-grown chickens when a field of grain or hay or other crop has been carried.

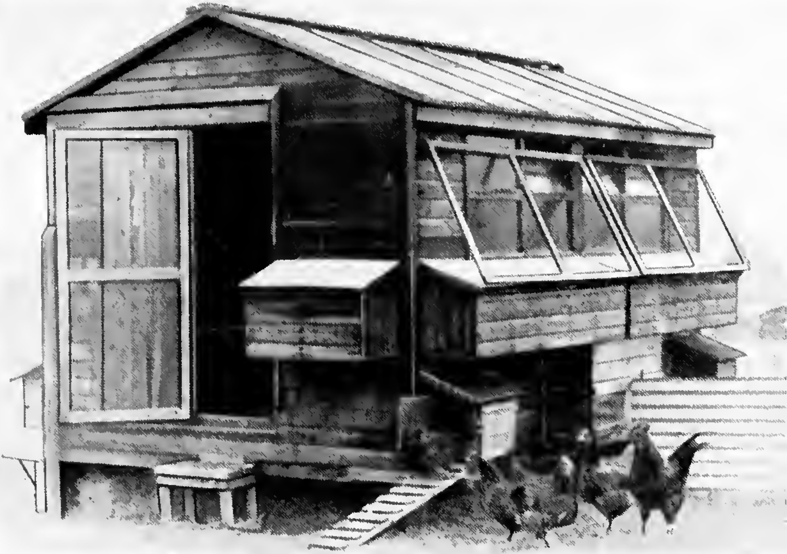
Scratching Sheds

Covered places for the birds to scratch in during bad weather are termed scratching or covered sheds. As a rule they are not wholly boarded up in front—three sides and the roof are solid, but the front is wire netting to admit as much light as possible. A scratching shed is indispensable for many purposes, especially for winter egg production, which it fosters to a great degree.

Scratching sheds have, unfortunately, receded from popularity.

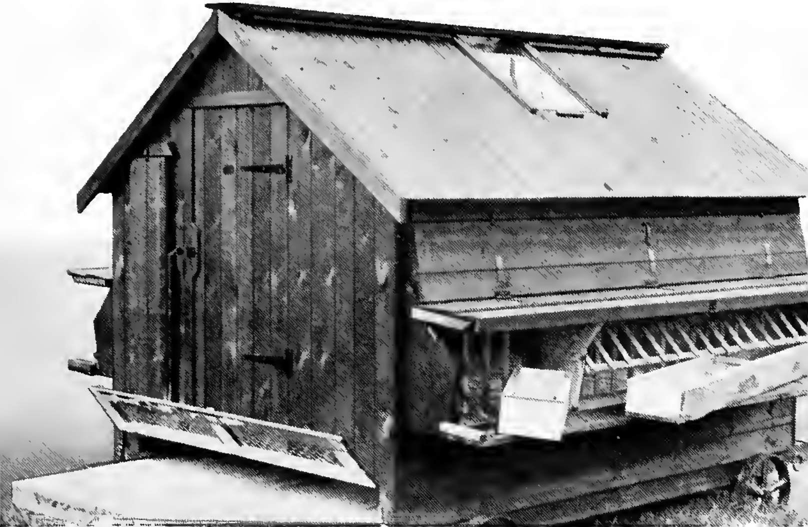
The Six-by-four

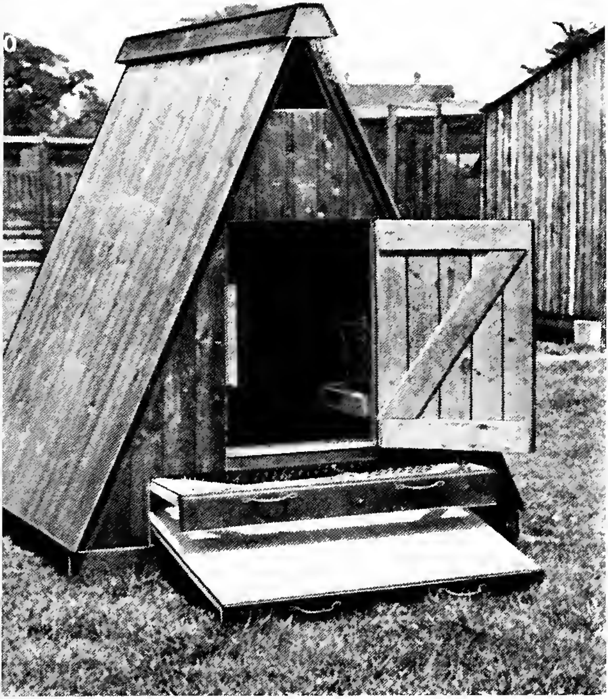
Contrary to general opinion this is not a pure and simple garden house. It is, indeed, a very popular little house among breeders of exhibition stocks, but instead of accommo-



ABOVE : Popular type of double-breeding pen house. Notice the outside nest boxes and watering arrangement. Light frames in front of windows prevent perching on the nest boxes. Other desirable features are the sheltered pop-holes (lower right), the jump-up platform beneath the open door and corrugated iron wind-breaks

BELOW : Colony house fitted with slatted and solid floor. Popular for field or stubble work. Desirable features : Easy feeding and cleaning arrangements, roof lights on either side, drag rings at both ends of house



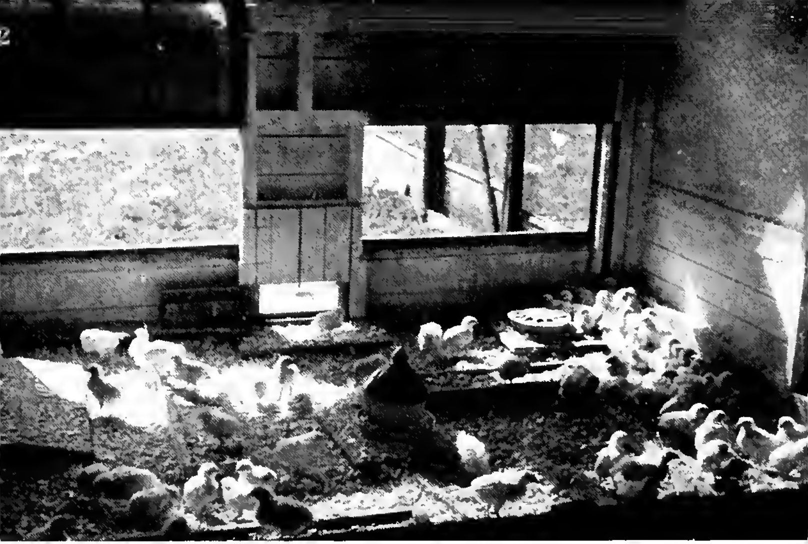


LEFT : Apex type night ark with wired and solid floor. A similar type of ark is seen in use in the foreground of the photograph below. Regarded as utility appliances these arks are used mainly as accommodation for growers between the 10-12 weeks stage and up to the time they are ready for transfer to the laying house. Approximate measurements are 6 ft. in length, 4 ft. 6 in. to 5 ft. width and 5 ft. 6 in. to highest point of ridge. Notice how the ridge is protected from penetrating rains

BELOW : Here is probably an ideal lay-out for a commercial egg and breeding farm. Large semi-intensive house
the farm a free passage. Large building on the left is mainly given over to chicks and has outside runs on both
buildings on t

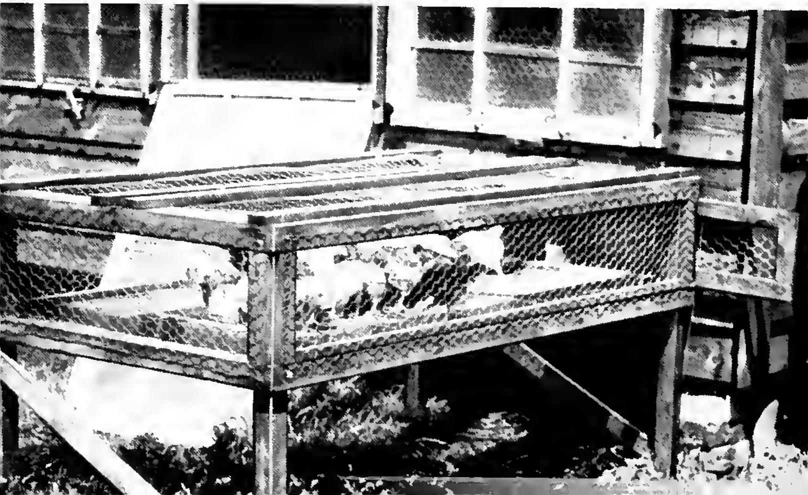
RIGHT : Inside an intensive or semi-intensive laying or breeding house. Occupants are Light Sussex hens mated to Rhode Island Red males resulting in the most popular sex-linked cross. Judging from the sprung trap-nest fronts the hens are pulling their weight. An "extra" in this house is the wire-netting above the nest boxes to prevent the birds from using the tops as a perch

the major part of the equipment ; notice the spacious runs and alleyways wide enough to permit transport on
In the distance are the breeding houses, while the incubator house and food stores are among the brick-built
of the picture



These photographs serve to emphasise the need for direct sunlight in chick rearing. The brooder house (above) is equipped with low set supplementary windows to permit free entry of ultra-violet rays direct on the floor of the house. Even in the best of weather the young chicks spend more time indoors than out

Below is a small but serviceable sun-parlour attached to a section of an intensive brooder house. The growers are tempted outside by being fed and watered there. Floors of sun parlours are, in the majority of cases, wired or slatted, rather than solid



dating six laying pullets it would be given over to a breeding quartette. Another difference would be that a large outside grass run would be provided.

As a garden poultry house the six-by-four takes a lot of beating. Its 24 square feet of floor space provides comfortable accommodation for six laying pullets while it is easily fitted with an outside run, covered or open, which adds to its utility.

Many other types of garden houses exist, some of them developments on the six-by-four and all based on an allowance of four square feet of floor space per bird.

Chicken Coop

The most useful chicken coop is divided into two compartments, and should measure about 4 ft. by 2 ft., divided in the middle by a movable partition of bars 2 in. in width and 2 in. apart, the middle bar being made to slide up and down. This screen keeps the hen to the warmest end of the compartment, which is boarded all round and provided with a solid wooden door for easy access. The other part is provided with bars 2 in. wide and 2 in. apart so that the chicks can readily run through to the earth beyond. The object of the double coop is to keep the hen in the covered part out of the wind and rain and give the chicks a little cover in which they can have food and drink in bad weather. Economically such a coop soon covers its cost in saving food, as a hen with liberty of both compartments soon scatters the food and upsets the water pot.

Broody Coop : Fattening Coop

These may be described together, as the one appliance answers both purposes. In length it may be 3 ft. or in multiples of 3 ft., in height 18 in. Back, ends and top are solid, but the floor is made of bars 1½ in. apart, and the same width, and the front of bars 2 in. in width and 2 in. apart, one or two of which should be made to slide up and down and thus serve as a door.

A " V " shaped trough should be provided to run along the whole of the front. This serves as a food container when the coop is used for fattening purposes or as a narrow shelf when it is a broody coop, so that the water pot and food vessel may stand on it.

There are, of course, lots of subsidiary appliances. This little book is not, however, an encyclopædia and only the more important can be listed.

Subsidiary Appliances

Trap Nests: There are so many patterns of these that all cannot be described; sufficient to say that it differs from the ordinary nest in that when the hen enters she touches some mechanism which closes the door and prevents her exit until the attendant goes round to release her, at which time he can take the number of her ring or the colour of it and credit her with the egg laid.

Outdoor Cages: These are a development upon the indoor battery cages and are mainly restricted to units of four or six. They follow very much the lines of an indoor cage excepting for the fact that they are weatherproof.

Bone Cutters: This is a handy appliance for cutting up bones just as they come from the butcher's, bones being one of the most nutritious forms of food. The bone cutters are made in several sizes, the small sizes to fit on a bench, larger ones already mounted on stout wooden legs.

Egg Testers: These are mainly for the use of incubatists, who, by their aid, can detect which eggs are fertile and which are not. Good testers are, however, essential on every egg-producing farm for determining the internal quality of eggs.

Cramming Machines: There are two types of cramming machines, the one hangs on the wall, and the other is fixed to a wooden frame to wheel about the aisles of the fattening pens. Their mode of use is given in the chapter on fattening.

Water Vessels: Too much importance cannot be laid on the water supply and the provision of large capacity water vessels. A portable water cart is also very valuable, and should be provided with very wide wheels, especially on soft, spongy, or clayy land. Water vessels are obtainable in a variety of designs, the best being those that are easily cleaned. On modern farms water is laid on to every pen.

Food Troughs: Every pen should be provided with a trough for the soft food. The ordinary V-shaped wooden troughs are commonly used, but there are a variety of manufactured designs in galvanised metal and sizes to suit adults, growers or baby chicks.

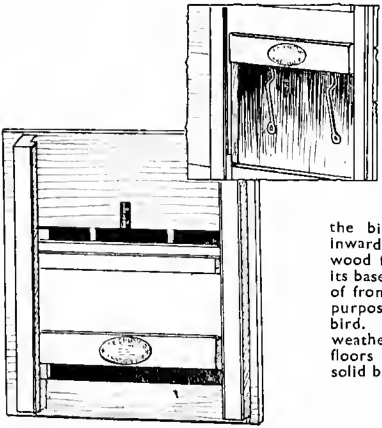
Troughs are especially necessary in semi-confined runs, as soft food thrown on the grass picks up a considerable amount of dirt which may be injurious to the birds. Grain thrown on the hard land is not nearly so harmful, as the birds pick it up cleanly.

Dry mash feeding has witnessed the introduction of self-supply hoppers, some of which hold large quantities of mash. A non-clog type is desirable and for this purpose the smooth metal hopper is preferred to the sometimes roughly-constructed wooden container.

A common mistake with large capacity hoppers is to refill without first making certain that the older mash is eased towards the base of the container. An occasional "spring-clean" of interiors is also essential.

The presence of galvanised or good wooden bins, on a farm are a sure indication of the thrift of the proprietor, and they undoubtedly pay a good dividend, for the most wasteful form of feeding is feeding from sacks. When galvanised bins cannot be obtained, ordinary wooden bins or even apple-barrels are better than nothing. Both rats and mice are averse to tar, and if wooden bins are tarred at the bottom and for a distance up the sides they generally leave such bins alone.

Sitting Boxes: These are not the nest boxes in which the hens lay, which should never be used for sitting purposes, but are separate compartments each complete in itself and about 16 in. square, or slightly larger, provided with a good shutter so that the birds can be restricted to the nest and not interfered with in any way. Ranges of these are sold from four to a dozen in number and are more satisfactory than the old-fashioned method of a tea chest, a sack, and a couple of bricks,



Here is a popular type of trap-nest front, the upper sketch showing the nest open for the entry of the bird and the lower with the front in a sprung position. The hanging wires seen in the top sketch form the mechanism of the nest; when the bird enters she pushes the wires inwards and this releases the sliding plywood front which is slightly weighted at its base to ensure a free fall. Some types of front are hinged and buttoned for the purpose of providing easy removal of the bird. Because of their stuffiness in hot weather many breeders fit wire-netted floors to the nests in place of the usual solid bottom.

which may do for the cottage lot but not for the poultry farm, where hatching by natural methods is still carried on as part of the pedigree breeding routine.

Egg Boxes: These are made in various designs for holding either a dozen eggs or several hundreds and can be obtained ready-made. Boxes to hold a dozen are the most useful for selling odd lots or sittings. There is a separate compartment for each egg. When eggs are sent in large quantities regularly to the same customer a light box for the accommodation of a hundred or so can be obtained, as it would save much labour, and the eggs arrive at their journey's end in as good condition as if each had been laboriously packed separately.

In recent years box fittings known as fillers have come into popular use. Most of the stout cardboard National Mark boxes are fitted with fillers. Constructed of papier mâché, the eggs rest in the pressed-out "pockets" of the filler and one filler is used between each layer of eggs.

This chapter does not pretend to cover every appliance used on the poultry-farm, each day that passes finds additions being made to the list, additions which demonstrate more than ever the growth of mechanisation. Indeed, the more mechanised a farm can become the more time will be left for its owner to give to the routine work of breeding and production.

Fencing

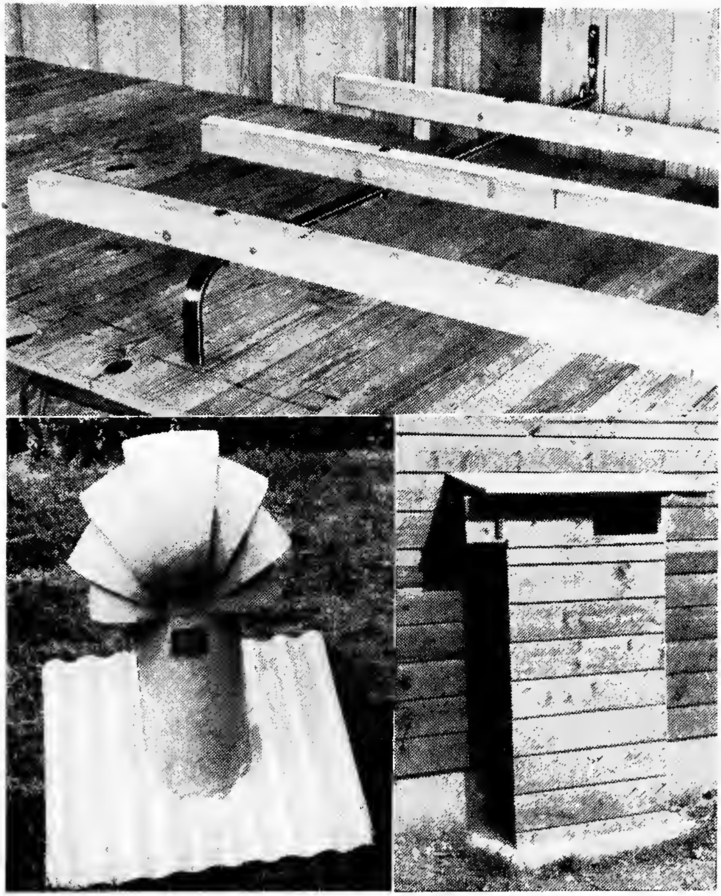
Another large item of expenditure is the fencing and the posts which carry it. These latter should be substantial, two-inch squaring being a useful thickness with 3 by 2 for corner posts. In order to prevent the netting sagging, there should be a post every two to three yards.

Height of the fencing depends a great deal on the breed. In many of the big laying establishments the wire netting is not more than four feet in height, but for breeding pens and light breeds a rather higher fencing is necessary.

A useful fencing is one with two feet of boarding at the bottom and four feet wire netting surmounting this. It will add to the life of the posts if they are dipped in a bucket of tar before they are used. Seven feet six inch posts will be wanted for six feet fencing, and five feet six inch posts for fencing that is four feet high.

Netting, despite the fact that it is already galvanized, may be tarred before being put up; this will practically double its life. It is a very messing business to tar it once it is up. The most expeditious way of tarring it is to make a wooden trough

PERCHES AND VENTILATING AIDS



Well-designed perching arrangements set the seal on a good house. Photograph at the top shows an all-in triple perch constructed of 2 ins. by 2 ins. wood on a strip metal carrier. The unit hooks on to the back of the house, is easily removed for cleaning or can be slung clear of the droppings-board at any time. Ventilation, particularly in brooder or incubator houses, is all-important. Bottom photographs show, left—a modern type of ridge ventilator as seen fitted on the battery house on page 15. On the right is a shaft ventilator common to incubator houses. A gauze-covered opening at the base of the shaft and inlet to the house admits the fresh air. Current of air is controlled by the slide that will take a roll of netting, and fill it with hot tar, and if the thick variety is used, the hotter the better.

The netting should be plunged in for a quarter of an hour or twenty minutes, and allowed to be thoroughly heated. It is then hooked out and the heat of the wire will cause the superfluous tar to drain off, and in two or three days the netting will appear as if it had had a coat of black varnish. When thin tar is used, the same method is adopted but the netting does not come away so cleanly. The netting can be placed to drain over the trough and so save waste.

Houses ought to be treated with one of the wood preservatives. If bought ready made, buy them already treated, as they can be done for a shilling or two more per house.

Shillings Save Pounds

Conservation of labour must always be regarded as of primary importance, but not necessarily to the extent as was once wrongly imagined, namely, when it was fondly thought that one man and a boy could tend 3,000 head of stock.

What the owner has to consider is this: A few extra shillings spent on perfecting his appliances can easily be made to save pounds in other directions. To quote an example: Direct water supply to the battery house or to each alley of breeding pens or laying houses may mean a heavy initial expenditure. But how much less is this cost than that of the maintenance of water butts and carriers, plus the almost endless expenditure of labour in refilling any number of individual containers?

CHAPTER III

FOODS AND FEEDING

FEEDING of all stock should be done with a definite object, first that of keeping the birds alive, then with the object of either producing eggs or flesh at a profit.

The scientist is of great value to the poultry student; he tells us that some foods are most suitable for egg production, fat production, or feather production, and that whatever the effect one desires to produce, whether size, fat, length of feather, or colour of feather, it can be accentuated—or a natural tendency modified—by the judicious selection of food stuffs.

Most of the proprietary food manufacturers have their own testing and experimental farms, and their own scientists. So general has this become that few poultrymen now mix their own mashes.

The principal substances for poultry feeding can be divided into cereal meals or grains, the pulse or leguminous seeds, of which peas and beans are a sample, animal foods, which are fish, meat and grub life, and vegetables and grasses.

Albumen Costs Money

Other foods are waste products from these or combinations of them. The poultryman will be well equipped on all points if he obtains an analysis of any food he uses and sees how it compares with the foods enumerated in our tables and the price he is paying for it. The dearest foods are those containing most albumen, so it is of importance to get them at the lowest possible rate consistent with quality.

All foods contain one or more elements, and the success of feeding livestock lies in the right selection of the elements likely to produce the desired results. The white of an egg, for instance, is albumen, therefore it is natural to select foods rich in albumen to produce eggs.

For the purpose of the poultry farmer foods are divided into five great heads.

Protein	Carbo-hydrates	Fats	Water	Ash, or
Albumen	Starch	Hydro-		Mineral
Nitrogen	Amylaceous	carbon		Matter

The reader will observe that there are several names for these elements, and as they are confusing to the learner, only the most common are used.

Protein builds up muscles and tissues, renews and rebuilds the system, and is an egg and flesh forming material.

The body is practically a furnace and is constantly burning something, a slow combustion stove. Carbo-hydrates provide the fuel for this stove. One of the cheapest forms of fuel is starch, which is a heat producer.

Protein could be burnt as fuel, but as it is an expensive food it would not be wise to try and keep up bodily heat on protein alone; it entails too much strain on the organs that have to deal with it.

Carbo-hydrates in excess are fattening because they more than balance the requirements of the body and the surplus can be stored up as fat to such extent as to become a disease. This must always be borne in mind.

Fats are the highest form of heat producers, consequently are the best fuel, but are often dearer than starch.

Fibre is Wasteful

Fibre is generally in the sheath or husk of the grain, and is only digestible to a slight degree, although more so with some animals than others. A food containing an excessive amount of fibre is, therefore, a wasteful food to buy, yet some is necessary to provide bulk to enable the bowels to carry out their work properly.

The remaining factor is ash or mineral matter containing salts, potassium salts, magnesia, calcium, phosphates, bone, earth and soda, all necessary to the life and growth of sturdy chickens and to egg production. Therefore *Proteins* are *Tissue Producers. Carbo-hydrates* are *Heat and Force Producers. Salts and Mineral Matter* are necessary to formation of *Bone, Salts, Muscle, Juice and Blood Corpuscles.*

The proper construction of a dietary is a matter that can only be determined by each individual, or by an expert for him, who will take into consideration the natural food in the herbage or in the soil in the shape of grub life of every description, and economically from the waste products that can be used.

In these days of progress one can, therefore, see how a scientist determines how much of one ingredient should be used to balance another, and this is termed balancing a dietary or finding its nutritive value or ratio. For example, if we take one part protein and four parts carbo-hydrates and

A good food-store is not always the one that costs most money. It is the one that permits ample room for sacks and bins, a wide alleyway for entrance and exit, and, above most other things, a clean floor. Unopened bags of food off the floor and a neatly-folded pile of empty sacks reflect care on the part of the poultryman.

nothing else, it is obvious that the ratio is one to four—one part protein and four carbo-hydrates, and it has been found by experiments that a bird when laying requires an average diet of 1 to 4½, and when it is not laying the diet may be 1 to 6 or 1 to 7.

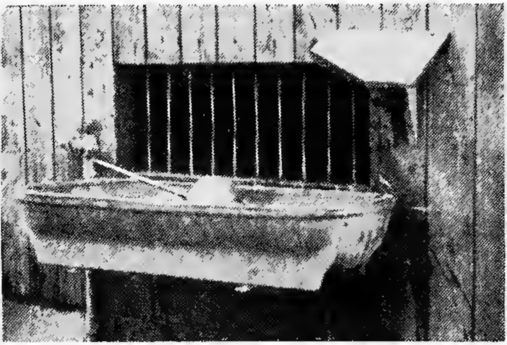
It has also been found that what will produce eggs will produce a chicken, so that the ratio for chicken rearing is approximately the same as for egg production.

When the war-time scheme of rationing was drawn up by Ministerial Officials, they, in conjunction with their scientific advisers, based the entire scheme on an average daily consumption of 4½ oz. of concentrated food per bird.

This was regarded as a very fair average, but, as already indicated, consumption varies not only with the birds, but also with the seasons. It must be obvious that when insect life and herbage, both natural foods for poultry, are abundant, lesser quantities of supplied foods are required. In the Spring and early Summer months consumption would naturally be lower than in Winter.

It is said that livestock feeders are born and not made. Not everybody subscribes to that view, believing that knowledge can be quickly acquired by a close study of the stock's requirements. Nothing, in their view, equals constant observation and the application of common sense to the task in hand.

For instance, the more intelligent poultryman will pay extreme regard to the requirements of his stock in the winter months, even going to the length of visiting his laying and breeding houses some hours after the occupants have gone to roost. He will pass along the perches handling birds here and there to ascertain not only their bodily condition but also the state of their crops. What he expects to find are crops partly filled with food even at 9 or 10 p.m. and if they do not present that desirable state of affairs his last meal of the day will be made heavier.



An outside water supply on an intensive laying house. Water is controlled on the ballcock principle and the fact that it is outside means no splashing and longer life to litter.

He may also find that there is a tendency towards overfatness or, conversely, that general condition is low. His programme of management would then be changed to suit the occasion. Yes, these nightly visits teach us a lot.

Let us now get down to the rock-bottom facts of feeding, dealing with protein, carbohydrates and oil in the order named.

Too little protein delays normal growth and development, too much is wasteful as well as giving rise to kidney troubles. It is important therefore to ensure that the correct balance of 1 to 4½ is maintained both for chicks and laying birds while the need during the range period, say from 8 or 9 weeks to maturity, is 1 to 5½.

These figures must not be taken as hard and fast rules that must on no account be broken; they are approximate guides and some attempt should be made to see that the ration is near these standards.

To judge a meal or a mixture by these standards is simple. Let us take the case of a grain first. A table of analyses will show that wheat contains 12.3 per cent protein, 71.1 per cent carbohydrate and 1.8 per cent oil. Note that these are digestible ingredients. Now oil is more efficient than starch (carbohydrate) as a source of energy, in fact it is 2.3 times as useful. Thus to convert the oil to starch values the sum is 1.8 x 2.3 or 4.14. This figure added to that of the starch (71.1 + 4.14) gives us the starch equivalent of the energy part of wheat or 75.24. Thus the ratio of wheat is 12.3 : 75.24 or 1 : 6.1.

A double-sided field hopper used as a dry-mash container for growing or adult stock. To make it vermin proof, or as a means of controlling the feeding, hinged covers are fitted over the feed openings

This figure is a long way from that given above as suitable for feeding layers and the ratio at once shows that wheat is not a complete food for layers, chicks or even for growers. What the farmer has to do, therefore, is to draw up a ration which will fill the complete requirements of his birds according to the purpose for which they are kept, i.e., breeding, egg-production or table.

Now let us examine a typical ration and see how suitable it is on the same basis. Here is the mixture chosen :—

4 weatings.
2 bran.
2 maize meal.
1 ground oats.
1 fish meal.

	Protein	Carbohydrate	Oil
1 weatings contains	16·3	61·6	4·2
1 bran "	16·2	55·6	4·2
1 maize meal "	9·3	70·3	4·3
1 oats "	12·5	60·7	4·4
1 fish meal "	60·1	2·6	6·5
therefore			
4 weatings has	65·2	246·4	16·8
2 bran "	32·4	111·2	8·4
2 maize "	18·5	140·6	8·6
1 oats "	12·5	60·7	4·4
1 fish "	60·1	2·6	6·5
10 parts of mixture has	188·8	561·5	44·7

thus the ratio is 188·8 : 561·5 + (44·7 × 2·3)
or 188·8 : 664·31
or 1 : 3·52

Now a ratio of 1 : 3.52 is too close (the standard was 1 : 4.5) but a ration similar to that taken as an example is used in conjunction with a grain feed. Usually equal parts of grain and mash are fed. Thus the ratio of the daily feed is the average of the ratios of the grain and mash. Let us assume that the grain feed is wheat. Thus :—

1 mash	1 : 3·52
1 wheat	1 : 6·1
2	2 : 9·62

or 1 : 4·81, a result that is sufficiently close to the standard for all practical purposes.

The albuminoid ratio, as this is called, can be of considerable help to the poultry feeder, but one word of warning should be given. The tables for analyses should be figures specially prepared for use by poultry keepers. Based upon tests with larger farm animals they may not be reliable.

One case will show how the figures might differ. The cow, for example, can make great use of fibre in the food for, being a ruminant, the fibre is exposed to the action of the digestive juices for a long time. But the hen makes little use of fibre and this portion of the feeding-stuff is of little or no use to her.

It should not be necessary to emphasise that the figures should show digestible proportions of the total and not the gross amount of the carbohydrate or protein contained in the material being used.

Comparisons on this basis have been used for many years to assess the merits of a mixture. But there is one important point on which the ratio of protein to starch fails—it takes no account of the volume of the mixture. Indigestible fibre has no food value to the laying bird but it is necessary in a ration. Unless the intestines are relatively full the glands secreting digestive juices are not able to function properly.

Thus it might be possible to devise a concentrated food that would supply all the nutriment needed by the bird yet fail to keep it healthy because the digestible part of the foods could not be absorbed into the blood stream. On the other hand it is not difficult to imagine a mixture that would contain all the necessary materials in the right proportions yet fail to give enough food because there was too much bulk.

Ten ounces of mash might contain all the food necessary to meet one day's wear and tear and leave a margin for the bird to produce a 2 oz. egg. But such a mash would fail because the bird is physically unable to eat 10 oz. of food.

Limited Fibre Content

Thus in checking a ration there is yet another point that should be considered. The total fibre content of the ration, i.e., of both mash and grain parts of the diet, should not be less than 4 per cent and not higher than 6.5 per cent.

In larger farm animals feeding is based mainly upon the output of the individual. Dairy cows in particular being fed in strict relationship to the milk yield. In the case of the hen individual feeding is not possible, but there is likely to be considerable waste if the amount available for the bird to eat is not controlled.

A great deal of work in this connection has been done by Prof. E. T. Halnan at the National Poultry Institute at Cambridge. He has found by trial the exact weight of protein and starch equivalent (carbohydrate + oil × 2.3) needed for maintenance and for production. The maintenance needs of the hen are constant, but her production needs will vary greatly with the season and from one flock to another. These figures are :—

Weight of bird	Protein	Starch equivalent
3 lb.	1·9 grams	47·5 grams
4 lb.	2·5	51·8
5 lb.	3.1	56·0
6 lb.	3·7	60·2

In addition to the above needs the production of a 2 oz.

egg will require 12.5 grams of digestible protein and 38 grams of starch equivalent.

In normal times it is usual to regard the grain part of the diet as supplying the maintenance requirements of the bird, leaving the mash to provide the production needs. The mash may be a special mixture of meals available in a hopper at all times, or it may be carefully weighed out and fed as a wet mash. This is not so wasteful as might appear for the individual appetite of the bird varies with the rate of laying, though individual birds may eat more than is necessary.

Calculations based on Halnan's tables show that to feed grain in this manner means a daily allowance of 2¼ oz. for light breeds and 2¾ oz. for heavies. These figures are a little on the high side and they take no account of the food picked up by birds on range.

If grain is used at this level it provides more protein than is needed for maintenance. In fact if a light breed flock is fed with grain alone at the rate of 3 oz. per bird per day it provides enough digestible material for maintenance and the production of about 130 eggs in the course of a year (36 per cent production). The comparable figure for heavy breeds would be 3⅓ oz.

Calls on Her Reserves

This sounds quite good but it is found in practice that if a bird, through breeding, is capable of laying 200 eggs in the year is only fed at a level sufficient to produce 130 she will continue to lay drawing on her reserves in the body. When these are exhausted she will moult and there is an end to laying for some considerable time.

Before going on to consider the composition of a mash to balance the grain part of the diet it is interesting to note that the relatively high levels of grain feeding suggested by the work of Halnan were in commercial use in Denmark for very many years.

Halnan himself suggests that if a wet mash and grain diet is employed, then large amounts of grain and small amounts of mash should be used. If dry mash is to supplement the grain he suggests that the daily ration of grain be 1½ oz. for light breeds and 2 oz. for heavies, plus free access to dry mash hoppers.

In the final choice of systems, however, the relative prices of grain on the one hand and cereal by-products used in the mash on the other must have some say. When grain prices are ridiculously low it is an obvious economy to use more whole corn.

The next point is the composition of a mash to balance the grain portion. Here experience will indicate the type of mixture that is sufficiently palatable for the bird to eat readily. A mixture of 4 weatings, 2 bran, 2 maize meal and 1 ground oats, together with the necessary amount of protein-rich food, for which we might take fish meal as typical, gives the following ratio:—

	Digestible protein eggs	Starch equivalent eggs
4 weatings	19·6	26·84
2 bran	9·2	8·86
2 maize	6·4	18·30
1 ground oats	6·6	14·06
9	41·8	68·06
1 lb. cereal mixture contains ..	4·6	7·56
1 lb. fish meal contains	17·2	6·48

The mixture that is needed is required solely for production of eggs therefore the numbers of eggs producd by the D.P. must be equal to the numbers of eggs produced by the S.E. of the mash. Let X equal the amount of cereal mixture needed to balance 1 lb. of fish meal and the answer to the problem is found in the following formula:—

$$\begin{aligned} 4{\cdot}6\,X + 17{\cdot}2 &= 7{\cdot}56\,X + 6.48 \\ \text{therefore } (7{\cdot}56 - 4{\cdot}6)\,X &= 17{\cdot}2 - 6{\cdot}48 \\ \text{or } 2{\cdot}96\,X &= 10{\cdot}74 \\ \text{or } X &= 3\tfrac{1}{2}\text{ lb.} \end{aligned}$$

The balanced mash must contain 3½ lb. of the cereal mixture to each 1 lb. of fish meal, thus the complete formula becomes:—

4 weatings.
2 bran.
2 maize meal.
1 ground oats.
2½ fish meal.

This, however, is only part of the story. It remains to find out the weight of mash that should be fed to balance the daily allocation of grain. To do this it is necessary to find out the numbers of eggs that can be produced by 1 lb. of the balanced egg mash:—

Weatings ..	4	× 4·9	19·6
Bran ..	2	× 4 6	9·2
Maize ..	2	× 3·2	6·4
Oats.. ..	1	× 3·3	3·3
Fish meal ..	2·4	× 17·2	43·0
	11·5		84·8

Therefore 1 lb. of egg mash will produce 7.3 eggs.

Earlier it was stated that an allowance of 3 oz. per head provided sufficient food for maintenance and the production of 36 eggs from a flock of 100 birds. It the aim is to produce 70 eggs from the same flock the mash to supplement the grain must provide enough material for the production of a further 34 eggs. This means that for a light breed flock 4¾ lb. of mash is needed.

Reducing the mash and grain to the terms of weight needed per 100 birds a light breed flock needs 18¾ lb. of grain and 4¾ lb. of mash while a heavy breed flock needs 20¾ lb. of grain and the same allowance, 4¾ lb. of mash.

From these examples and the tables given below it will be possible to calculate rations for flocks of any given size fed in any manner from the traditional 2 oz. of grain per bird per day up to the suggested 3 oz. of grain.

Potential Saving

The importance of these newer standards lies in the potential savings of total food that can be made. It was commonly assumed before the war that a laying bird ate from 4 to 4¼ oz. of food per day. But the suggested standard of 3 oz. of grain and ¾ oz. of mash means a saving of ¼ oz. of food in a high producing flock (70 per cent production) or a reduction of 1/16th in the food bills without hindering production.

	Proportion per unit of weight		Egg production data. No. of 2 oz. eggs provided for in 1 lb. meal.	
	Digestible Protein	Starch Equivalent	In D.P.	In S.E.
Alfalfa meal	0·108	0·226	3·9	2·70
Barley and meal	0·076	0·651	2·8	7·77
Beans and meal	0·222	0·659	8·1	7·87
Blood meal	0·795	0·773	28·9	9·23
Buckwheat	0·091	0·603	3·3	7·20
Earthnut cake meal ..	0·439	0·743	15·9	8·87
Fish meal	0·474	0·543	17·2	6·48
Maize and meal	0·087	0·766	3·2	9·15
Maize (flaked)	0·092	0·857	3·3	10·23
Meat meal	0·639	0·867	23·2	10·35
Meat and bone meal ..	0·464	0·661	16·9	7·89
Milk (dried skim)	0·314	0·764	11·4	9·12
Oats and S.G.O.	0·092	0·589	3·3	7·03
Potatoes	0·016	0·181	0·6	2·16
Soya bean meal (extracted)	0·419	0·678	15·2	8·09
Wheat (strong)	0·116	0·752	4·2	8·98
Wheat (weak)	0·083	0·749	3·0	8·94
Wheat midds (fine) ..	0·072	0·755	2·6	9·01
Wheat midds (coarse) ..	0·142	0·571	5·2	6·82
Weatings	0·135	0·562	4·9	6·71
Superfine weatings ..	0·148	0·745	5·4	8·90
Wheat bran	0·128	0·371	4·6	4·43
Whey (dried)	0·114	0·838	4·1	10·00
Yeast (dried)	0·378	0·688	13·7	8·21

The importance of a regular water supply is very great. If there is any choice, water with a slight trace of iron in it is the best, and hard water is advantageous to poultry; soft or rain water ranking last. A very free water supply is necessary.

Grit is also mentioned in chapters on soil, but, with few exceptions, on every farm a supply of grit is necessary. The hard, many-sided flint is one of the most economical forms that can be given.

Earlier editions of this book made little or no reference to limestone grit. This was not due to careless omissions or even bias. Limestone was, in fact, little known in those days. Its outstanding value, both as a grinding agent and as a splendid source of lime supply, was not appreciated until long after the first World War. Nowadays it is used extensively throughout the farms of this and many other countries.

It is a common error to think that the giving of oyster shell is sufficient; one can manage with it, but it is a poor substitute, and, for vigorous digestion, limestone or blue flint is best. Oyster shell and cockle shell are two common sources of lime for shell formation, consisting chiefly of phosphates and carbonate of lime.

How the Gizzard Works

To explain the object of giving grit, it is necessary to know something of the gizzard where the grit is deposited. In this large muscular organ a rhythmic contraction is constantly going on, which presses the grit hard against any substance that comes between it, in the same way as if the grit is placed between the palms of the hands and they are rubbed together. In this way much indigestible matter which a bird swallows is triturated or reduced to fine powder, thus allowing the digestive juices to extract as much nutriment as they can, which is more than in the case of many animals.

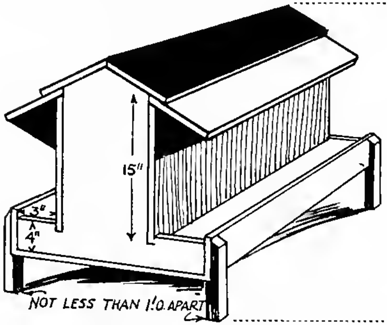
Salts are an important constituent of the blood and gastric juices. Limited quantities are found in the foods, but those who like to give extra should allow only very small quantities, something less than 1 per cent., in the mashes.

CHAPTER IV

DRY MASH FEEDING

DRY Mash means a mixture of various meals in their dry condition, just as they come from the miller or factory. It would be perfectly easy to fill two or three chapters with dry mash recipes, but in order that the reader may not be confused, only those recipes that have stood the test of application are given. If the chapter on feeding is mastered first one should be able to direct one's own affairs in dry mash feeding, for the same rules apply, and it is rather fascinating to be master of the subject.

Dry mash is given in hoppers or in troughs. Hoppers will take a week's or a fortnight's supply, but are liable to clog—that is, the meals do not run down, in which case it is necessary to shake the hopper when near it. Only metal or very well-planed wood containers should be used, and mash should be poured into the hopper—never *pressed* in by hand. The hopper and trough may be made any size so long as the openings from which the birds obtain the meal are kept to sizes large enough for the birds to feed without waste.



A large variety of dry mash hoppers are seen in every day use. Here is a serviceable double-sided type designed for use in an intensive house. Main measurements are given but length will, of course, depend upon the number of birds which the hopper is intended to supply. Main difficulty with dry-mash containers is that of clogging. Users should, therefore, make a regular practice of seeing that the mash flows freely to the source of supply.

Dry mash to give uniform success must be most thoroughly mixed, and it is for this reason that some manufactured dry mashes are more successful in use than others—because, the meals have been *ground together* after mixing. This may not be absolutely necessary, but it emphasises the point that the meals should be well mixed. Large quantities may be mixed on any clean floor, turning the more concentrated meals, or fine meals, out first and mixing them thoroughly before adding the more bulky part of the ration, such as

Bran, Clover Chaff, etc. Clean shovels should be used to turn the heap over repeatedly until is it obviously well mixed.

DRY MASH (A).

	lbs.
Short cut clover Hay	2
Bran	2
Meat or Fish Meal	2
Weatings	2
§Maize Meal	1
†Ground Oats	1
Charcoal	¾
Table Salt	1½ ozs.

GRAINS TO USE with this Dry Mash Formula.—

Summer: Wheat and Oats alternately.

Winter: Oats 1 lb.; Wheat 1 lb.; alternately with Wheat 3 lb.; Maize 1 lb. The maize must be either broken or kibbled.

§ Or Barley meal may be used.

† May be omitted during the very hot weather or reduced one half—using similar weight of weatings instead.

DRY MASH (B).

	lbs.
Short Cut Clover Hay (or Lucerne)	2
Bran	2
Weatings	2½
Pea or Bean Meal	1
§Maize Meal	1
Meat Meal or Beef Scrap	1
Charcoal	¾
Salt	1½ ozs.

GRAINS TO USE:—

Summer: Wheat and oats alternately.

Winter: Oats 1 part; Wheat 1 part; with Wheat 3 parts; Maize 1 part.

Parts to be by weight.

Always use kibbled or split maize.

§ May be reduced one half or omitted in the hot weather, using similar weight of weatings instead.

TIME TABLE AND WEIGHTS OF FOOD.

1.—SUMMER. 7 to 7.30 a.m.: Grain 2 ounces per bird. Dry Mash *ad. lib.* during the day. Water *ad. lib.* during the day.

WINTER. 8 to 8.30 a.m.: Grain 2 ounces per bird. Dry Mash *ad. lib.* during the day. Water *ad. lib.* during the day.

2.—SUMMER. 7 to 7.30 a.m.: ½ oz. grain per bird.
11.30 a.m.: ¼ oz. grain per bird.
5 to 6 p.m.: 1 oz. grain per bird.
Dry Mash and Water *ad. lib.* during the day.

WINTER. 8 to 8.30 a.m.: ¾ oz. grain per bird.
Midday ¼ oz. grain per bird.
Dusk 1 oz. grain per bird.
Dry Mash and Water *ad. lib.* during the day.

In both the above cases the birds will be allowed out for some hours per day unless severe weather prevents such a course, in which case green food should be given to the birds in their shed during the day.

It would be folly to state a dogmatic routine, as there are so many variations of feeding methods that the most favourable for the condition to be met should be chosen.

Quotations given from Halnan's experiments in the previous chapter do not, for instance, entirely coincide with the mixtures given above.

There are some dogmatic principles that are worthy of observance, and they are :—

To clean the dropping board as early in the day as possible, so that the air may not be tainted.

To rake all grain into the litter so that the birds may find some difficulty and considerable exercise in finding it.

To keep the litter dry and raking it over daily tends to dry it.

To collect eggs at least twice a day and to see that they are dispatched during the afternoon or evening of the day they are laid.

Intensive Feeding Methods

(Dry Mash)

Summer	Winter
a.m., ½ oz. grain per bird.	a.m., ¾ oz. grain per bird.
noon, ¼ oz. grain per bird.	noon, ¼ oz. grain per bird.
evening, 1 oz. grain per bird.	evening, 1 oz. grain per bird.
Dry Mash *ad. lib.* during the day.	The grit, both flint and oyster shell, always available.
Water ditto.	
Green food in the morning.	

Splitting the grain feeding into three portions and giving at times stated provides maximum amount of exercise and also coincides with visits to house—1, to open—2, to collect eggs—3, to collect eggs and close up.

Dry Mash

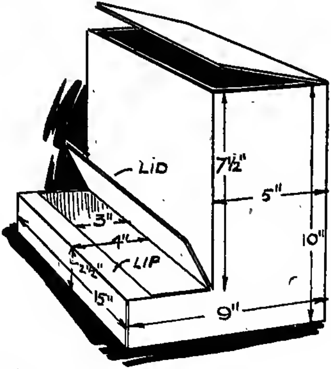
Short Cut Clover Hay or Lucerne ..	2½ lbs.
Bran	2½ lbs.
Weatings	2 lbs.
Meat or Fish Meal	1 lb.
Maize Meal	1 lb.
Dry Bone Meal	1 lb.
Charcoal	¾ lb.
Salt	1½ oz.

Dry Mash advised in Semi-Intensive methods A and B may be used if ½ lb. of Bran and Clover is added to each 2 lbs. of those ingredients in each case.

Egg Production in Garden Runs

Egg production in garden runs—City or Suburban—offers magnificent scope for hundreds and thousands of Town dwellers to indulge in a profitable live stock hobby. The production of eggs under such circumstances is deserving of all the encouragement that the Government can give it.

Eggs can be produced by birds kept indoors entirely with a space of from 3 to 4 square feet per bird, but it saves a good deal of labour if some outside run can be given. For this I advise about 15 square feet per bird so that a run measuring 7 yards by 2 yards would be about right for eight birds. Even then, if the outside run can be covered over it is to be recommended.



Grit containers of the size illustrated are large enough for any number up to 50 birds. In some a dividing partition is fitted to keep flint separate from oyster shell. Where limestone grit is used both as grit and as a provider of lime a one-compartment container only is required. Consumption of grit is controlled by the hinged lid. The more inquisitive members of the flock sometimes adopt the annoying habit of wasting grit by throwing quantities out on the floor of the house. Where this occurs thin steel bars can be inserted, two inches apart and from front to rear of the feeding space.

The Town dweller will do better to keep say two flocks of six to eight birds each than he would with 12 to 18 birds in one flock under such conditions. Small numbers usually mean a better egg average.

The city poultry keeper may decide that dry mash will best suit his requirements; if so, he should turn to the chapter on dry mash feeding and adopt just the same principle for his small unit. By far the greater majority feed on wet mash because waste products from the house can be used, and such a course has much to recommend it in these days of necessary economy.

We would take as a standard for the wet mash 2 measures of bran, 1 measure of meat or fish meal, ½ measure of maize meal or ground oats, barley meal or flaked maize, 2½ measures of weatings, and to this add up to half as much again by weight of minced vegetables or house scraps; these, of course, include potatoes and culinary vegetable waste, meat or fish scraps so long as they are not salt.

Allow the birds to eat as much of this as they will in fifteen minutes about half an hour before they go to roost. This generally works out at 3 to 3½ oz. per bird in the winter and less in the summer.

Green-food is Essential

The morning ration would be 1¼ oz. of grain per bird, plus ½ oz. at dinner-time when the green food is given. If possible, have a dry-mash hopper or a box with laths nailed across, about 3 in. apart, about half filled with a mixture of 3 parts bran, ½ part short cut clover if possible, ½ part meat meal and ½ part weatings. Allow the birds free access to this during the day; it provides some interest and is a set-off against feather eating and egg eating, which sometimes occur simply because the birds have nothing to do.

If the city dweller would like to give the soft food in the morning by all means let him do so, but in this case give rather less. A ball of the mixed food a little larger than a 2-oz. egg per bird will usually be enough, to be followed by ½ oz. of grain per bird at dinner-time, and 1½ oz. grain per bird at night, dry mash as usual. Some attempt should be made to give green food two or three times a week.

The available supply of grit in the soil will soon be used up, and the birds should have a supply of hard grit, oyster shells or limestone as detailed in another chapter.

One point where the small poultry-keeper scores decisively over the professional is that he can call upon certain quantities of household and garden waste to help in his programme of feeding; his war-time feeding programme was, in fact, made up mainly of such waste foods.

Such a programme would not, of course, give the eggs that could be expected from the adoption of a more scientifically balanced ration, but the domestic has, and he probably always will, regarded scraps as legitimate food for his hens.

CHAPTER V

MATING UP THE BREEDING PEN

A SUITABLE male bird to head the breeding pen would be one that is full of life and vitality, crows vigorously, is always busy scratching, and in constant attendance on the hens. The best of hens and pullets are those that have not an undue weight of fat in abdomen, that are always alert, busy scratching about all day, bright in comb, and not thick or heavy-looking about the head.

The number of hens to a cockerel depends on the strength and vitality of the cockerel. As a rule eight to ten hens are given to a cockerel for utility breeding, which means hatching about March. Multiple breeding pens consist of 20 or more hens and a corresponding number of males, up to 300 hens to 30 males are examples.

For exhibition purposes, a cockerel is used with three or four hens or pullets from November to March, when another three or four may be allowed. When a two-year-old or older male is mated up, two or three mates should be the limit until the end of March, when two more may be allowed. Some two-year-old birds are as vigorous as cockerels, if so, give more mates.

Age on One Side

Also allow more mates if the pullets or hens become very bare of feathers on back, whatever age, or whatever number the male may already have. A cockerel with two-year-old hens, if they are likely to lay early enough, is generally the best mating. A cockerel (ten to twelve months) with pullets well grown (ten to twelve months) is also a very good mating, far better than a cockerel to over-fat two-year-old hens. A two-year-old or older male is not desirable, except for some particular purpose, such as exhibiting excellence, or to establish a strain, or line breeding.

All male birds should be kept away from the females during the moult. There is never any necessity to mate up more than a month in advance of the time eggs are required. The average time for the majority of eggs to be fertile is ten days after the introduction of the male birds, supposing that the hens are near to laying at the time.

It is no part of a work like this to treat in detail the intricate subjects of line breeding. Briefly put, line breeding is a system of breeding without having resource to very close in-breeding. Having found by trap-nest or other means that a certain bird is the best layer of the flock, anyone can perpetuate those qualities, providing the bird is perpetent and not a "sport," which means that provided a bird comes from a line that has been bred for some specific object for some time, and is not a chance purchased bird that may or may not be perpetent.

Starting off with two such birds, male and female, the produce will be birds containing half blood of each parent. Take the best cockerel from the group, and mate back to the hens, and take the cock, now two years old, and mate to the best pullets, thus obtaining two groups, each of which will have $\frac{3}{4}$ blood of one side and $\frac{1}{4}$ of the other. Now, if we mate a $\frac{3}{4}$ male blood cockerel to the $\frac{3}{4}$ female blood pullet, the result is just the same as the result of the first mating, namely, half the blood of the male, and half of the female.

Important Features

It follows then that breeding can be kept on for years in this way, and some good points retained, but not improved. Improvement must come from selection only, or the introduction of fresh blood.

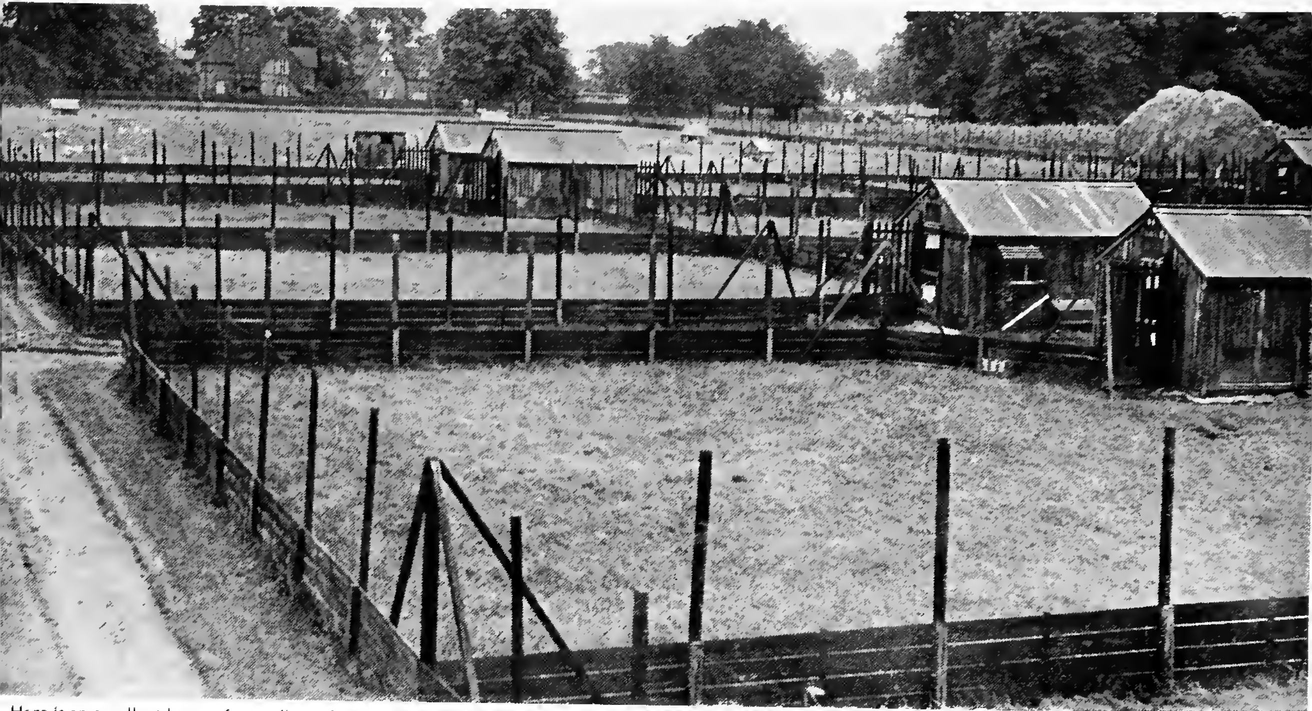
The most important feature in the mating up of breeding pens, is that the pullets or hens employed, also the cockerel, must have descended from a good winter layer, that period being between October and Christmas. A minimum number of eggs to be laid from October 15 to January 15 is placed at thirty. So that no cockerel should be used in the breeding pen unless his mother laid thirty eggs in the period named.

Such a cockerel should be mated with females that have themselves produced a similar number of eggs in the winter period. In this way fecundity can be fostered in a particular strain of birds.

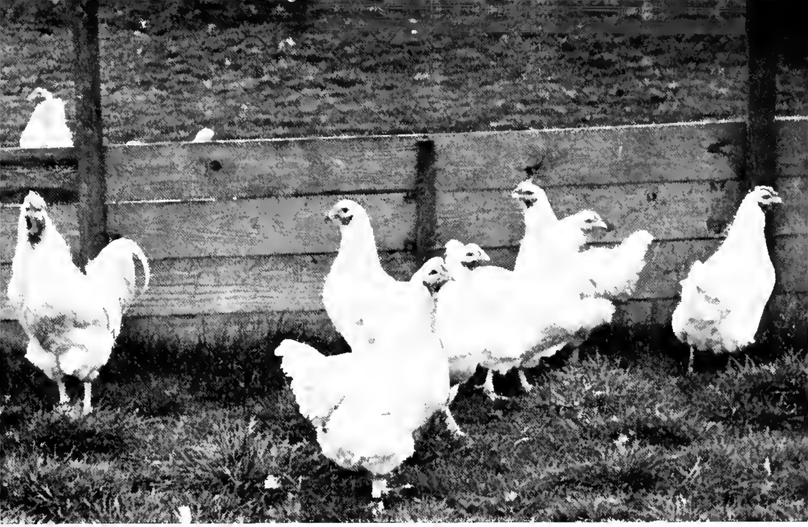
A pullet that lays over 30 eggs from October 15 to January 15 or November 1 to February 1, is termed an L2 bird, and the progeny derived from it are said to have been bred from an L2 bird. A pullet laying less than 30 eggs is known as an L1 bird.

Avoid small eggs, and use only females for breeding that laid eggs over 2 oz. in weight. They should at least pull down the scale with a snap, and it is just as important to use cockerels bred from such eggs.

The above refers to weight of eggs produced in the pullet's first winter, and are minimum weights, and should these coincide with a good yearly egg record, as shown by the trap-nest, one is working on very safe lines. The bird producing the most eggs during the winter is a better bird than one making a higher yearly record and making it mostly during the summer months. There is no special credit attached to summer records.



Here is an excellent lay-out for small unit breeding pens (one male to seven to ten females) As with the farm lay-out on a previous page wide alleyways between the pens are provided. Other desirable features include: Large, well-grassed and well-kept double runs, soundly constructed wire-netted fencing with support posts at six-feet intervals, adequate wind breaks, and uniform housing to which direct access is gained without entering the runs. In the background is part of the chick-rearing field



Small unit breeding pens such as are depicted here are great favourites with producers of pedigree stock. Number of females to each male varies according to the season. In the early part of the year (January-February) it is customary to allow six females, but for March and April work the number is increased to ten or even a dozen. It is not unusual to see two males, full brothers, employed—one resting while the other is in use, or one for early season work and the other for later use

Generally accepted matings are cockerels to hens and cocks to pullets, the first-mentioned being the best. Common failure with the older males is infertility early in the season. Hens, on the other hand, come through the moult with renewed vigour and make ideal mates for well-matured first-season males.

Egg production has been, and can be, increased by careful breeding. The trap-nest, used by practically every breeder, is an appliance which prevents the fowl from wandering off the nest until released by the attendant. In entering the nest she touches a trigger with some part of her body or foot and this releases a door that has been kept up by a catch, and the bird is a prisoner. On her leg she carries a numbered leg band or coloured ring, corresponding with this she has a chart, and every egg when laid is credited to her. The eggs the bird lays should be pencil marked when taken from the nest, and the chickens hatched from them carefully marked by toe punching or marking rings.

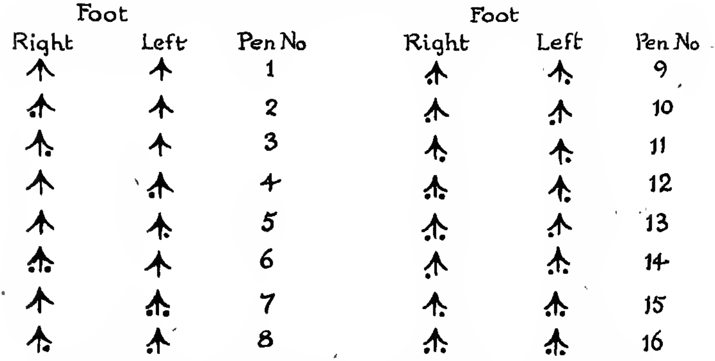
The eggs from one hen can be hatched separately under a hen, or in a pedigree egg tray which fits into an incubator tray and prevents the mixing of chicks from different breeds.

The toe punch is a most useful mark and is used when the chicken is taken from the tray or nest. A small piece of skin is punched clean out between the toes, and, as a rule, the loss of blood is negligible and requires no treatment.

There are up to sixteen combinations of toe punches, after this the same punches can be repeated, the chick wearing a coloured ring on one leg. Thus: Blue ring and toe punches, Red ring and toe punches. By this method a much larger number of markings can be obtained.

"Mendelism" is the name by which certain laws in breeding are described, taking the name from the discoverer—an Austrian monk named Mendel. The results require careful

LIST OF TOEPUNCH MARKS



Sixteen different combinations of toe-punch marking are possible. For special identification purposes it is not unusual to see the punches accompanied by either numbered leg-rings or wing tabs

and patient study, and to many people are very difficult to understand. Whether or not they apply to poultry breeding, especially to pure-bred poultry, is as yet "not proven." By no means is Mendelism disparaged, but it is pointed out that it could not be discussed in the whole of this book, much less in the short chapter that could be devoted to it. A study of the various works on Mendelism is recommended. The results of the various experiments are given in signs and symbols.

Crossing a tall pea with a dwarf pea, if the greater number of tall peas appeared, they would be termed dominant, and those crowded out would be termed recessive.

The first cross was marked as F1 (the first generation). The produce of the plants produced were F2 (the second generation).

If the tall character prevailed, it would be Dominant. D. Crossing the tall and the short the produce might be

D2. + 2Dr. + R2.

Dominant, 25. Mixed dominant and recessive, 50.
Recessive, 25.

In the same way any other characteristics would be described.

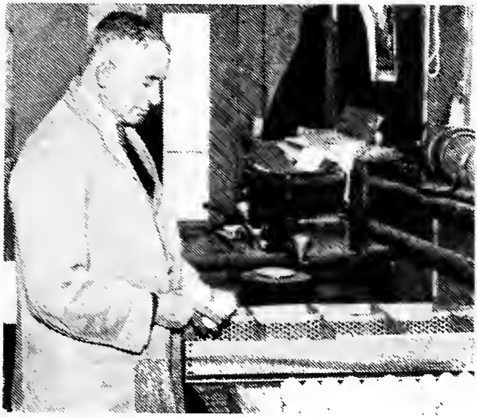
Bone Measurements

A system of grading or selecting poultry for egg production known as "Hoganism," after the originator Walter Hogan, is a system with which the tyro in poultry keeping will sooner or later come in contact. For a great many years, however, judges have made their decisions in Laying Hen Classes on similar lines, and there are methods of finding the layer other than by Hoganism.

Walter Hogan noticed that certain types of birds laid better than others, and that the good layers had certain points in common, such as the width of the pelvic bones. These measurements, the width between the pelvic bones indicating easy delivery of the egg, and depth of abdomen, which, with the measurement of the abdominal or digestive capacity, are points worthy of notice in making decisions as to which birds should enter a breeding pen. It should be remembered that Hogan's experiments were chiefly with Leghorns.

A Rhode Island Red may easily out-distance all the best of Hogan's measurements, but it by no means follows that she will be a better layer. Hoganism seems to be more applicable to birds of about 4 lb. weight. While a "handling" test may show the bird best fitted by Nature to lay, behind it all there must be the inherited factor to lay. Birds have been handled that would scarcely be good enough to be included in a breeding pen, yet they had laid from 272 to 300 eggs in twelve months. True, however, that they were Wyandottes.

While every credit is due to those undertaking these investigations, sufficient definite data does not appear to have been arrived at; when it is, it would be gratefully acknowledged.



Pedigree selection among the stock is carried on in the incubator room when eggs are transferred from ordinary trays into those specially made for pedigree work. These trays are divided into several compartments from which the chicks cannot escape or mix at hatching time. When they are removed, the chicks are either wing or leg banded for future identification.

The reader will recall that for as long as he can remember there have been classes for "Likeliest Layer" at most of the shows. Well, how did the old-fashioned judge deal with these before these new discoveries? The usual plan was to see which bird had the widest apart "vent bones" and the deepest "egg bag," for those were his ways of describing these features. Well, modern discoveries have proved that he was right.

These measurements were very similar to the Hogan system measurements. To explain what is meant by these measurements and where they were taken, any female fowl can be used as an object lesson. The bones that are of so much importance are below the tail and nearly in line with the centre of the vent, shortly, on either side of the vent. Those who have never examined these bones before will be astonished at the variety of shapes there are, as well as the thickness of them. Some are straight, and they are very few, most are curled to a greater or lesser degree.

One of the bones should be taken between thumb and finger to ascertain its thickness and gently nipped in this way, skin and all, the reader will then adjudge its thickness, which includes the skin. The thinner these bones the better, $\frac{1}{8}$ to $\frac{1}{16}$ indicating the best of the birds.

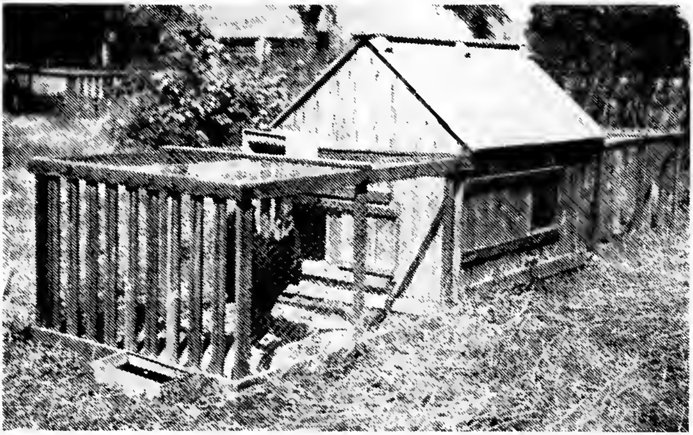
Those shewing over $\frac{1}{4}$ inch are more adapted for flesh production than egg laying, and such birds should not enter breeding pens mated to produce layers. Reference to the figures given in the form of a chart are Mr. Hogan's figures.

Capacity or { One Finger Abdomen	Two Finger Abdomen	Three Finger Abdomen	Four Finger Abdomen	Five Finger Abdomen
$\frac{1}{16}$ thick pelvic bone 36 eggs	96	180	220	250 eggs
$\frac{1}{8}$ " " " 32 "	87	166	205	235 "
$\frac{3}{16}$ " " " 28 "	78	152	190	220 "
$\frac{1}{4}$ " " " 24 "	69	138	175	205 "
$\frac{5}{16}$ " " " 20 "	60	124	160	190 "
$\frac{3}{8}$ " " " 16 "	51	110	145	175 "
$\frac{7}{16}$ " " " 12 "	42	96	130	160 "
$\frac{1}{2}$ " " " 8 "	33	82	115	145 "
$\frac{9}{16}$ " " " 4 "	24	68	100	130 "
$\frac{5}{8}$ " " " 0 "	15	54	85	115 "
$\frac{11}{16}$ " " "	6	40	70	100 "
$\frac{3}{4}$ " " "	0	26	55	85 "
$\frac{13}{16}$ " " "		12	40	70 "
$\frac{7}{8}$ " " "		0	25	55 "
$\frac{15}{16}$ " " "			10	40 "
1 inch " "			0	25 "
$1\frac{1}{16}$ " " "				10 "

Mr. W. Powell-Owen, known particularly to readers of *Poultry World*, is possibly the most outstanding personality for handling that the poultry industry has ever seen. Some of his prognostications are almost uncanny and he has done more for selection by handling than any other living person.

In order to obtain uniform and correct measurements, the fowl must be held in a certain manner, and the method advocated is to place the bird's head under the left arm and hold the legs with the thumb near the bird's hocks and the fingers clasped between and round the shanks. It should be held perfectly level, and not with head or fore-part either raised or depressed. This refers particularly to measuring between the vent, and from the pelvic bones to the end of the breast bone.

The capacity measurement refers to the size of the abdominal organs, which are, of course, the digestive organs. Unless these are large, the fowl cannot produce either many eggs or much flesh. The distance between the pelvic bones and the end of the breast bone is easily measured by placing as many fingers as will go between them, sometimes only two can be inserted, sometimes all four fingers.



Valuable pedigree males deserve far more attention than is sometimes given them. Here a well-bred Rhode Island Red cock is seen resting in a soundly-designed cockerel box with attached run. The box is divided across the centre to enable a duplicate run to be attached at the other end. It can thus accommodate more than one male at a time

Still one more measurement is that for condition, and this is taken at the breast bone. If the bird is in the best of health, the flesh will be well up to the point of the breast bone, if not it will shew some thinness there.

Another excellent guide as to the best prospective layers is the distance between the pelvic bones themselves. The poultry-keeper can always retain the best of his pullets by using these measurements. If White Leghorn pullets are being selected, or White Leghorn-White Wyandotte crossbreds, or birds of similar size, the distance between the pelvic bones should be from 1⅞ inches to 2 inches, if these measurements are taken when the birds are over six months old and obviously near laying.

Pullets only shewing 1¼ inches are usually poor layers. Anything over 2 inches in width is likely to make a very good layer, but when larger framed birds than those described are being selected, they should be ⅛ wider than the smaller breeds. Given other things required, it may be written that 2¾ inches between the pelvic bones corresponds to 280 eggs or more; 2⅜ up to 250 eggs per year; 2 inches, a much easier measurement to find, indicates an excellent layer. All these measurements refer to fowls just about or actually laying, for when not laying the bones close together again and measurements then are unreliable.

Measurements need not always be taken with a rule, the human fingers can be used and are assumed to be ¾ of an inch in width; thus, a fowl with one finger's width between the pelvic bones is of no value as a layer, two fingers indicate a fair layer, three fingers an excellent layer, and four fingers or nearly four fingers a layer of exceptional merit.

Phrenology in Poultry

Amongst the other interesting discoveries made by handling fowls was the one relating to the shape of the head, and it had reference to prepotency. It may be better perhaps to think of prepotency as the power to hand down. Both cockerels and pullets can hand down something, it may be good, it may be bad, exactly which of the two is handed down depends largely on the owner of the fowls.

Prepotency then, in a fowl, is indicated by the length of the back skull, which should be well below the ear. To measure this the bird should be wrapped in a cloth with head out of the wrapping, and be laid on the lap with the head away from the body of the operator, and the legs between the knees, stretching out the neck the thumb should be placed close to the skull where it joins the neck.

The fore-finger of the other hand is placed with the nail close up to the ear, and that is, the real orifice through which the bird hears, and which is easily found, as it is covered with a tuft of peculiar hairs. The nail of this finger is at right angles with the thumb nail. If the thumb nail is level with the top of the finger nail, prepotency is poor, if it is in advance of the finger nail, prepotency is at its lowest ebb, and a cockerel of this description would be useless as a breeder. If, however, the thumb nail is well behind the point of the finger nail, prepotency is extremely good. These are very fine measurements, for if the thumb is 1/16 inch behind the point of the finger nail, prepotency is good, but if 3/16 or ¼ inch these are most favourable measurements.

The question is, what better will the breeder be for knowing this? Supposing a cockerel is tested in other ways, he has 1/16 pelvic bone, 3½ fingers capacity, and 3/16 prepotency, such a cockerel will transmit excellent laying qualities to his progeny.

Take another with ½ inch pelvic bone, three fingers capacity. He, too, will be prepotent, but it will he table and not laying properties that will be transmitted; both, however, are useful in their respective spheres.

Rhode Island Red male to Light Sussex females is possibly the most popular and widely used sex-linked cross. Other "gold" males that can be mated to the "silver" Sussex females are listed in the chapter on sex-linkage

To summarise the breeding for egg production, it would seem breeding from a good laying hen is not a sufficient guarantee that her progeny will be like her, and that a cockerel bred from a hen that was a good layer must be mated with her. Even then it is not certain that the cockerel carries the prepotent or dominant factor, and this can be, as it usually is, risked.

The more certain way is to mate the cockerel bred from a good layer with a pullet, a proved L2 bird, and test the pullets produced from the mating. If they are up to, or better than, the standard of their mothers, or perhaps a little lower but still L2 birds, then he is clearly a valuable male bird and should be used for producing future stock birds for use on the farm.

CHAPTER VI

NATURAL AND ARTIFICIAL INCUBATION

THE first thing needed when anyone is desirous of getting a hatch of chickens, is the sitting hen, commonly called the "broody." A broody hen does not lay, her only instinct being to sit on those eggs laid by herself or other hens, until eventually she possesses a family of chickens.

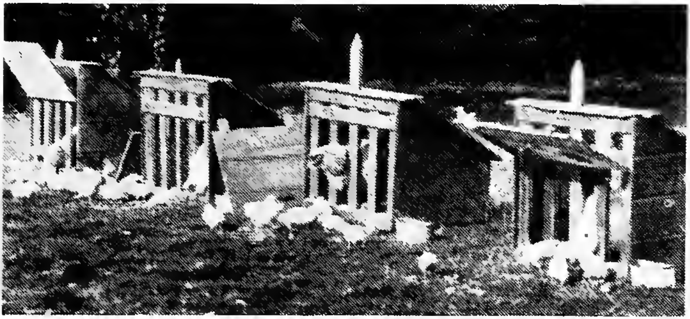
One of the first signs of a broody hen is the finding of a few feathers in the nest, if the hens are examined there will be a loss of feathers on the sides of the breast bone of those inclined to broodiness. If a bird is seen to go frequently to the nest during the day and stay on it for three or four hours, it is a sign of broodiness, but examination should be made of the nests at night, and when a hen is found on the nest after exhibiting these symptoms it is a clear sign that she is really broody. Also if a hen is stroked down the back she will ruffle her feathers, and spread out the tail feathers like a fan when she is broody, and may forcibly resent interference.

"Siddy" is, quite rightly, incubatist No. I. From her our scientific investigators have been taught that the turning of eggs during hatching is necessary, that moisture and humidity must be controlled if successful hatches are to result, and that the removal of infertiles and addled eggs has a beneficial effect upon the fertile eggs. A good broody hen has been known to throw out infertile eggs from her nest almost as fast as they have been returned. The box shown is approximately 15 inches square; note the ventilation holes at the front. They are duplicated at the rear of the box.

The size of the box for a sitting box to be comfortable should be sixteen inches square, so that the hen can spread herself out and do justice to the eggs entrusted to her. A large hen may cover as many as fifteen or sixteen eggs, but the number should be decided according to the size of the hen. When large numbers are given, sometimes all are not kept warm enough, and thirteen or fourteen is a fairly safe number for hen's eggs, less if duck eggs are being hatched.

The nest should be ventilated. This can be done by a strip of wood about an inch deep being cut off the top of the door. There are many ideas as to what is best in the bottom of the box, and a couple of inches of nice dry soil is as good as anything, if moulded into saucer shape so that wherever an egg is placed it will roll into the centre. Then line the nest with hay, first stuffing a large ball of hay into the corners then a little over the bottom of the nest, banking up the sides, so that when the hen is on the nest the hay will be level with the top of her back. Hay packs close together and keeps the heat better than straw.

The sitting hen should be fed regularly, but not allowed to come off and on when she likes, or the eggs may get too much cooling on some occasions. At dusk is the best time for feeding, so long as there is light enough for her to pick up the grains of corn, for she will then make the best use of her time and return to the nest without much trouble.



Despite the advance of artificial methods many thousands of chicks are reared every year by broody hens. When coops are arranged in the manner shown here it is easier to attend to food and water replenishments than would be the case if they were scattered unevenly over the field

Except in cases of illness dry hard corn is the best food, as it is slowly digested, therefore maize is a suitable grain. A little grit should be supplied, and water given to drink. Ten to twenty minutes should be allowed her to fulfil the requirements of Nature; in frosty weather eggs may be covered whilst she is off. If she is handled quietly even a wild hen will become docile before the end of the hatch.

If the broodies are scaly-legged they should be dressed with vaseline in which a few drops of paraffin have been mixed, after having been scrubbed with hot soapy water, and the bird allowed to sit a day or two on dummy eggs until it is soaked in.

Care must be exercised to see that none of the paraffin soaks on to the fleshy upper half of the leg as, if it gets there, the bird will suffer from leg-weakness of a peculiar type.

While the oil is soaking well into the legs and destroying the minute insect which causes the trouble the vaseline softens the scaly incrustations which are visible to the eye. At the end of a day or two the legs should be washed again with hot soapy water to remove the softened excreta of the insects.

So much for natural incubation. Let us now turn to the artificial method, a method which, although still in its stages of perfection, was practised by the early Egyptians thousands of years ago.

The notes which follow apply mainly to the smaller types of machine, ranging in size from 100 to 500 eggs, and which rely upon oil or gas as a means of heat. Such machines are vastly different from the large cabinet force-draught electrically operated machines now used on most large farms and in every hatchery in Great Britain. Cabinet machines are a law unto themselves and they demonstrate most clearly the terrific advances made in artificial incubation during the past two or three decades.

Avoid Draughty Situation

The small oil or gas burning incubator should not be placed in a direct draught between door and window, or door and fireplace, or the cold air will rush under the door with damaging effect to the eggs in the machine. It should be placed on a good firm bench about three feet from the floor, and, whenever possible, the bench should be wide enough to admit of the drawer resting on it when it is pulled out, and from this it will be seen that the drawer should not be taken right out when the eggs are turned. If the drawer is taken right out the cold air will get in and cool the walls of the machine, and detract from the temperature, and it will take an hour or two to get the temperature to the right degree again.

It is very essential that the eggs should be quite fresh, if possible under three days old. Another point is that an incubator should never be filled to its utmost capacity. If the machine is quite full the outside rows of eggs touch the outside of the drawer, and are beyond the range of temperature registered by the thermometer, as the heat shown by the thermometer stem is the heat of the bulb and not the heat of the surroundings immediately beneath the stem.

Mistakes are often made over this, for people think they are working at 103 degrees, but the eggs on the outside are not over 100 degrees, and as they are turned from time to time, the outside ones coming in the middle and vice versa, each in turn gets a prolonged chill and the result is an indifferent hatch.

Between every hatch the incubator should be thoroughly washed out with some good disinfectant of a strength that is fatal to all kinds of bacteria. Should an egg produced by a hen that is a carrier of bacillary white diarrhœa be included in the egg drawer, many of the other eggs may become contacts, as may the egg tray and other parts of the machine, in which case each succeeding batch becomes infected and develops that very fatal "B.W.D." amongst chicks.

There are other forms of bacteria in incubators that are fatal to the developing embryos, hence the need to give each batch of eggs a fair chance, menaced by no diseases from former occupants of the egg chamber. One form of bacteria that causes death in eggs in incubators, is singularly absent with eggs under hens, notably the "No. 9" baccillus. There are many excellent disinfectants on the market, and it is scarcely fair to mention one; and obviously impossible to mention all. So none is given. Perchloride of mercury 1 in 1,000 is good, but no better than some of the proprietary preparations. Perchloride of mercury must be handled with great care.

Rooms of Genial Temperature

At most experimental stations the rooms are of a genial temperature, rarely below 60 degrees and often as high as 70 or 80 degrees. In summer the broody hen may leave the eggs for an hour or more, but the temperature will be somewhat above 60 degrees, and they will be in a sheltered place, and well endowed with vigour inherent from the hen living in natural conditions. But it would be folly to give such prolonged cooling in cold weather with a temperature of under 40 degrees.

The reason for cooling eggs is that the embryo may at that time imbibe the larger amount of oxygen necessary for their growth. This at least is the reason usually given, but as there are birds that never leave the nest during the time of incubation, it is possible that it may be hunger that prompts a hen in natural conditions to leave the nest.

However, a well ventilated genial room is the best for incubation purposes, and if the incubator be correctly ventilated, cooling the eggs longer than the time it takes to turn them is unnecessary in cold weather. It must be said that eggs can be successfully hatched without any cooling whatever if there is sufficient air passing in the machine.

Cooling is given during the operation of turning them twice a day, which, unless the operator is very expert or the egg trays are of the self-turning type, takes about five minutes. The drawer should then be replaced and no additional cooling given until after the tenth day, when, if the room temperature is over 60 degrees, a few minutes more can be allowed if desired.

Although he has the more orthodox egg-testing lamp (seen on top of his machine), this incubatist is satisfied to test his eggs by the aid of an ordinary electric hand torch. Such a practice would not be adopted by a beginner. Eggs removed at the first test would be the infertiles and broken yolks ; doubtfuls are left to the second test.

The particular point to be observed in all this is that the incubator should regain the temperature of 102 degrees as a minimum and 103.5 degrees as a maximum (except forced draught or cabinet machines that are run constantly at 100 degrees) well within half an hour of the drawer being closed. If this rule is adhered to, the incubatist is not likely to go far wrong in the cooling of his eggs under any circumstances. Some people cool until the eggs feel only just warm to the back of the hand; this is a very rough and ready guide.

Whilst on the subject of cooling it is necessary to repeat that eggs can be hatched out satisfactorily, and produce strong chickens, without cooling, as the correct amount of fresh air is constantly passing through the machine. In some machines cooling is a certain corrective for deficiencies in ventilation.

Many failures in artificial incubation are caused through not making allowance for the weather. A machine may have been worked in May in such a manner that it gave excellent results, but such methods would not answer in the cold days of January. Very few people get a right conception of the heat of eggs half an inch below the thermometer, and in no two machines is the thermometer in exactly the same place. The thermometer above the eggs may register 104 degrees, yet the eggs below may not be 100 degrees, or in warmer weather one might find the thermometer 102 degrees and the eggs situated below it a trifle *higher*.

Uniform Temperature Throughout

The thermometer should not actually rest on the eggs, because it might at one time rest on a fertile egg, and at another time on an infertile one, and perhaps cause alteration of the regulator, but the thermometer should be on the same level and in the same stratum of air as the eggs.

It should be the aim of every incubatist to see that a uniform temperature of 102½ degrees at the lowest and 103.5 degrees at the highest should be maintained, again excepting forced draught on cabinet machines. Having done so, there will not be much more variation than in a natural state of incubation, which all must copy as nearly as possible.

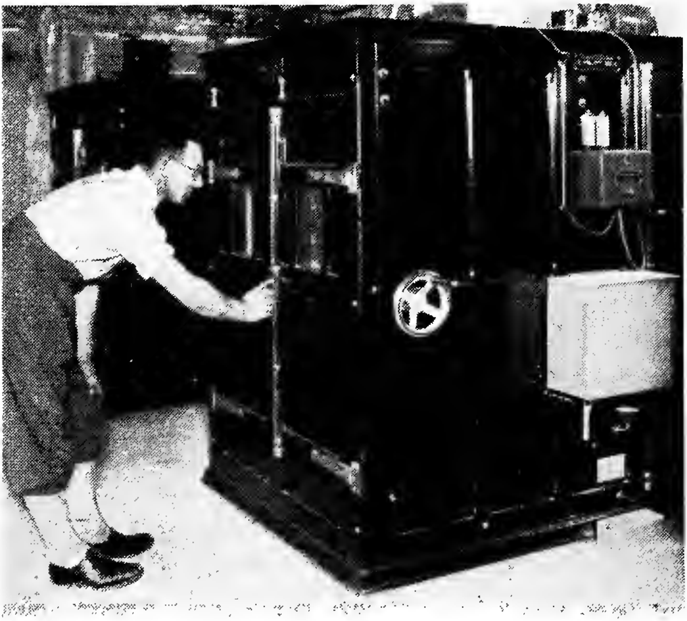
It is, of course, to be expected that the thermometer will "jump" a little towards the end of the hatch. Unless this "jump" is a big one it is not necessary to correct it.

Only the very best eggs should be saved for incubation. They must be a good shape and have a good shell free from hard sandy little lumps, and those with a thick band round should be avoided. The eggs should be stored in a cool room and covered with a thick cloth to check evaporation. It is as well to give them a slight turn now and then in order that the yolk does not become fast to the membrane lining of the shell.

Eggs that appear to be full of little holes or porous are not good hatching eggs, neither are those that finish with a tail or curly bit at the small end. Good, large, smooth-shelled, perfect egg-shaped eggs are those that give the best results.

The eggs should be clean, graded or sized before putting them in the machine. Eggs of even size should be chosen, for the more equal they are in size, the less difficulty there will be in keeping them at even temperature. The smaller eggs can be given to a hen to incubate or transferred to the larder. If possible choose those that seem the same thickness in shell.

Eggs in an incubator should be turned twice a day as nearly as possible every twelve hours. All who have sitting hens will notice how carefully they shuffle the eggs on returning to the nest, and poke some of the outer ones to the middle with their beak, and the inner eggs outwards. This is that all in turn may occupy the warm position of the central eggs, and for more important reasons. If an egg were left in one position, the water would go to the bottom of the shell and the yolk would float on the white, and there is the danger that in the incubator it would become fast to the shell.



Here is one of the latest types of cabinet incubators with a capacity for up to 5,000 eggs. Electrically operated and thermostatically controlled, these machines are now installed on most of our larger farms and in every up-to-date hatchery.

As the chicken is built up mainly from the white of the egg, it is important that a fresh portion of the white is brought in contact with the yolk on which lies the developing chicken. This, in itself, is enough to justify turning the eggs.

Testing the eggs for fertility must come sooner or later, and it matters not whether it be a beginner or the life-long poultry keeper, all are anxious to count their chickens before they are hatched, and it is only a phase of human nature to do so. There are advantages to be derived from testing, if it is carefully followed out.

Most of us are painfully aware of the scarcity of broodies early in the season, and systematic egg-testing enables us to make the most of them. For instance, three broody hens could be put to sit in one day; in seven days' time the eggs can be tested, and all the fertile ones be given to a couple of hens, the third broody can be given a fresh lot. When a large number of chickens are reared every season this testing is most important.

For the same reason two sizes of incubators can be kept, and after testing the eggs in the large machine the fertile ones may be transferred to the smaller incubator to finish off. Thus one large machine will act as starter to two small ones.

Moisture

Moisture or no moisture is always a debatable point; the trend of the times seems to be for moisture, as many non-moisture incubator manufacturers now send out moisture apparatus. It costs very little to supply moisture, and the operator will in time find out how much or how little is most suitable for the local conditions.

It is a proved fact that chickens from moisture machines are heavier than those from non-moisture machines, and even then are not as heavy as chicks hatched under hens. Therefore, moisture-produced chicks appear the nearest to the natural plan.

The usual directions for testing are that you should, first of all, hold a new-laid egg up to the light and observe its semi-transparency, then hold up to the light eggs that have been seven days under a broody or in an incubator; those like the new-laid eggs are clear, but any that are dark, and evidently contain something, are fertile. This is quite true as far as it goes, but, unfortunately, the embryo may die at any date, and it is very easy to have a dead embryo in the machine, fondly thinking that it is a live chicken. This mistake can be avoided by carefully studying the accompanying illustrations.

One test between the seventh and the tenth day is advised. Reference to the sketches on the opposite page will reveal that the most noticeable feature about the fertile egg (centre top) is the very clear and decided line between the air-cell and the rest of the egg. When this is sharp and distinct the egg is almost sure to contain a live embryo. Next to this the spider-like form will be noticed and then a few veins near the line of demarcation between air-cell and the rest of the egg. It is a sure sign of life if this spider-like form moves from side to side, and it is interesting to watch the rhythmic oscillation that tells of pulsating life within.

Compare this with the right top sketch and notice how indistinct the boundary line of the air-cell is. This mistiness is a certain sign of something wrong within. We look lower; no veins are visible, there is no dark little spider-like body pulsating, the space where it should be is quite clear. Look lower again. Here is a dark mass that moves to and fro, but it only moves as you turn the egg, and however you turn the egg the dark mass moves in an opposite direction. This is a broken yolk.

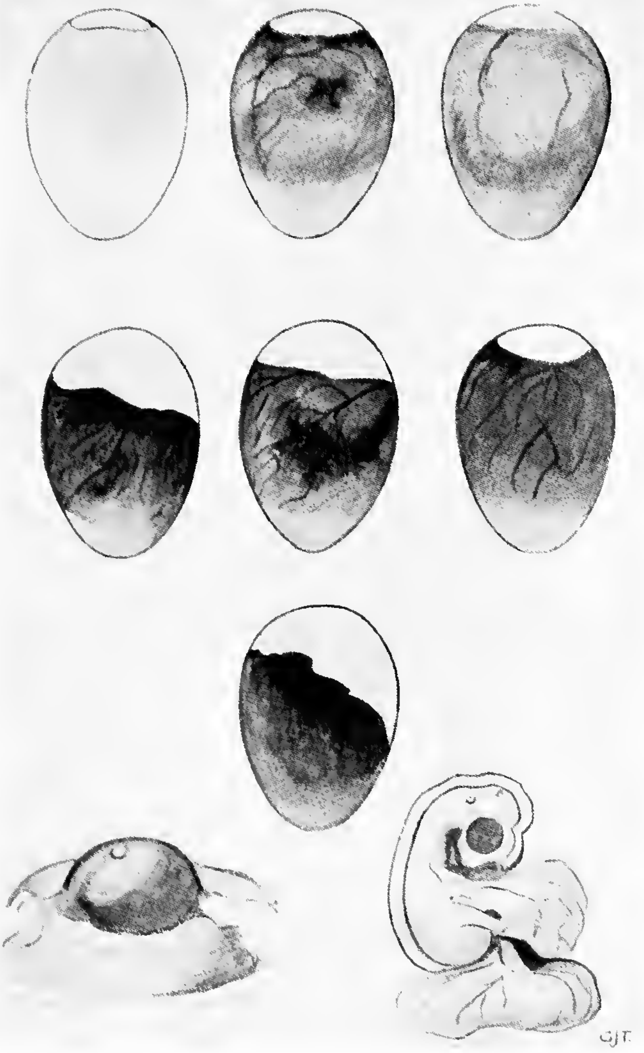
Broken Yolks

Unfortunately broken-yolked eggs are frequently mistaken for live ones. In the broken-yolked egg there may be a live embryo, but owing to the mixed contents of the egg, the blood vessels cannot grow as they ought, and generally show a red vein near the shell, as shown in the illustration.

The second row of sketches show the effect of moisture upon an egg during incubation. Too little moisture results in hurried drying down (seen in the sketch on the left), while too much moisture does not permit any drying down at all (right). Correct moisture control means better hatches and better and stronger chicks.

A few final words on the cabinet type machine. Most of these are fitted with separate hatchers to which the eggs are transferred on the 18th day. This is necessary for more than one reason, but the main point at issue is this:

Mammoth machines are not filled at one "helping," they are mainly used to give one third of their capacity each week. And as it is essential to give the hatching egg a higher humidity than that given to one in the early stages of incubation a transfer to a separate compartment in which humidity can be increased becomes necessary. The trays thus emptied are refilled with a fresh lot of eggs and continuity of the weekly hatch is maintained.



Diagrams depicting internal conditions of the egg during incubation. *Top Row* : Left, clear egg, 7 days ; Centre, fertile egg, 7 days ; Right, broken yolk, 7 days. *Middle Row* : Left, egg dried down too much, 14th day, too little moisture ; Centre, correct drying down ; Right, too little drying on account of excessive moisture. *Centre* : Ready to hatch (20th day). *Bottom* : Left, yolk and small white germinal spot ; Right, Embryo chick on about the 12th day of incubation.

Brooding of chicks can be done either in or out-of-doors and for each purpose special appliances are designed. Two of them are shown here. Above is a modern type of battery brooder, electrically heated and thermostatically controlled. In some types of batteries the chicks are moved one compartment up a week at a time ; thus the bottom compartment may contain week-old birds, while that at the top houses six-weeks old stock

Below is an outdoor or range brooder. This, as is obvious from a study of its make-up, is oil heated (only one burner of the three-burner lamp is shown). Measurements are approximately 7 ft. long, 3 ft. wide and 2 ft. 3 in. to eaves. It has double compartments, each of which accommodates 75 chicks

CHAPTER VII

CHICK REARING

REARING chicks artificially in small numbers is carried out either by artificial heat in some form, or what is known as a fireless brooder. The method of artificial heat is the most commonly used.

An artificial brooder is an appliance complete in itself. It is a warm chamber of varying dimensions, with a second chamber in which the chicks feed, and sometimes a third, although two may be regarded as the maximum of requirements in this direction.

One form of brooder is that in which the heat is supplied by means of a paraffin lamp. This stands in the middle of the sleeping compartment, and is sunk through a circular hole in the floor, so that the oil well is below the level of the floor of the brooder, this brings the light and heat where it is most needed. The air supplied to the lamp comes in through the reservoir well, or, in brooders that have two floors, it comes between the floors and ascends by the aspiration caused by the lamp, until it strikes a radiator, which deflects the heat on to the backs of the chicks.

Feed Away from Heat

The radiator is a piece of metal placed on a false lid and does not cover the entire top of the sleeping compartment by two or three inches all round, and usually an iron nut or some other device separates it from the woodwork of the lid. The hot air, after warming the compartment, is drawn between the metal and the timber, to a circular ventilator in the wooden lid, where it is allowed to escape, being controlled by a slide.

The chicks run from this sleeping to the feeding compartment, and should never be fed in the place where the source of heat is situated. The outer compartment generally has a small mesh wire-netting front, and inside this, a sheet of glass, which does not reach the top by a few inches, and which can be withdrawn altogether in warm weather.

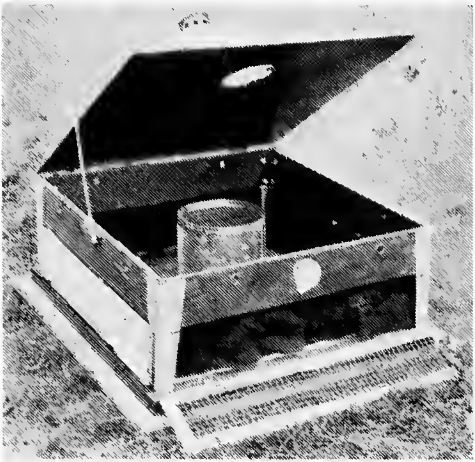
Chicks are put straight from the incubator to the warm compartment, the temperature of which should be 90 degrees or thereabouts when the transfer is made, decreasing 5 degrees weekly. They will need encouragement of some sort to leave the warm compartment for the first few days, but once they find their way about, they will be quite off hand as far as this attention is concerned, and will receive the prescribed number of meals in the outer compartment.

Another form of artificial brooder is heated by a hot water tank over the chicks' heads, in another by a hot water pipe going through the compartment, and yet another case by a hot water pipe going right round the compartment. Others have a tank in which a certain amount of hot water is placed twice a day and a certain amount of cooled water withdrawn, but for practical purposes the lamp as heating agent is perhaps the best.

Fireless Brooder

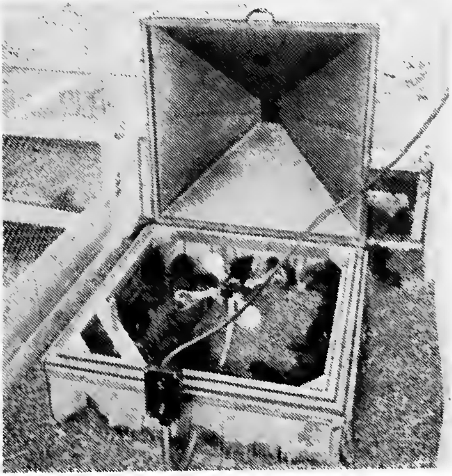
It often happens that in April or May an odd brood can be reared by a fireless brooder. This is a wooden box, about 2 ft. square and 18 inches or so in depth. On the inside, at a distance of 8 inches from the floor, a frame rests, this is covered with calico and sags a little; in the middle of this three layers of thick felt are placed, usually turned back a little at the corner to allow ventilation. By removing one felt every week the chicks are gradually cooled off. When necessary, the frame can be raised higher to suit the growth of the chicks, the idea being that they should be able just to touch the top of the sagging canvas with their heads while they are young. Ventilation is on the side of the brooder by which the chicks enter.

Here is a popular type of outdoor brooder and rearer. Fully portable, it can be used either as an all-in unit or the chicks can be permitted access to an outside run. The brooder is divided across the centre, and the closed-in compartment houses the heating arrangement which is usually a specially constructed paraffin burning lamp. See also p. 73.



A small 50-size chick brooder for inside use. Heat is provided by an oil - burning lamp housed in the wire guard. While the body is wood and metal the lid is all - metal for obvious reasons.

The whole principle of this brooder is to conserve the heat generated by the chickens themselves, but if it should show any appearance of dampness, it would be necessary to allow more ventilation. The chickens are better in bunches of 50 or more, than in small units. In constructing an outdoor brooder or foster mother for 50 chickens, the size of the heated compartment should measure 2ft. 6 ins. to 2 ft. 9 ins. square, and the feeding compartment, 3 ft. 6 ins. by 2 ft. 6 ins. or 2 ft. 9 ins. Height will be in accordance with the size of the lamp, but



Another small brooder similar to the above with the exception that it is electrically heated and thermostatically controlled. Both these brooders are very popular for indoor work on pedigree farms where small units remain the order of the day.

usually the height from the inside floor to the radiator is between 10 to 14 ins. As long as the radiator just clears the lamp it is sufficient.

A foster mother for 100 chicks should be 3 feet square in the heated compartment and 4 to 5 feet in the feeding apartment, and of the same height as in the case of 50 chicks.

One is frequently asked which is the best type of brooder. As a matter of fact there is not a best type. There may be a best type for working under certain conditions, but, apart from the broody hen, a best for one and every condition has not yet been found.

One of the most successful and useful forms of artificial brooders, particularly for the small holder, is one heated by an ordinary storm or hurricane lantern, a very safe form of lamp indeed. There are strong objections to the ordinary paraffin lamp, but a hurricane lantern obtains a supply of air underneath the compartment, therefore the lamp is not burning the air of the house, and the pure warm air coming up the sides of the lamp is dispersed round the sides of the compartment. The lamp being circular, this warm air is more thoroughly dispersed among the chicks which surround it than it could be if they lay together in a mass in the compartment.

Attention to Lamps

In the coldest weather such lamps may require filling twice in the 24 hours, but in the absence of snow or frost they usually last the clock round without any attention whatever. The very low cost of such a method of brooding brings it within the reach of the smallest purse.

A humbler method than any other is a hot water bottle (filled twice in the 24 hours), wrapped in flannel or blanket, or a heated brick covered with woollen material. Either of these can be placed in a small box, and a light framework lid laid over, which carries a cushion or pillow to conserve the heat.

Battery brooders are appliances for rearing chickens entirely indoors on specially made wire floors. They represent the minimum amount of space in which chickens can be reared. They are most unnatural appliances, and it is not advisable to rear breeding stock by such means.

Their usefulness appears to be that of caring for the chickens for the first month of their lives, during which time they usually have to be confined indoors, whatever system is used. Some limit their use to 19 days, but general experience is that a month is a workable proposition, after which the chicks either go to "coolers," if being reared for table, or to a brooder house, fold units, slatted floor houses, or colony houses where they may require some artificial heat for a month longer, if being reared as layers.

Battery brooders may be single, or double tiered, or even go as high as four tiers. A small size battery for 600 chicks takes up a floor space of 6 ft. 3 ins. by 2 ft. 6 ins. Larger sizes are 12 ft. by 32 ins., 800 chicks; 20 ft. by 32 ins., 1,600; 30 ft. by 32 ins., 2,400; and 40 ft. by 32 ins., 3,200.

The single type of battery brooder for 50 to 100 birds, which is a convenient table height, cuts out much of the labour of ordinary brooder house work.

Whatever the appliance, Nature remains the same and for the young chick a temperature of 90 degrees is essential during the first week, and the usual scale of dropping 5 degrees per week is a safe one to follow. In warm weather a temperature of 70 degrees should, however, be enough for 4-weeks old chickens. Temperatures should be checked by the disposition of the chicks; they should sit contentedly together at night. Where huddling is evident it is an indication of too low a temperature, and if the chicks are lying out flat with necks on the floor, the temperature is too high.

Subdued Light Preferred

Where there should be sufficient light to enable the chicks to see the food in the containers, bright light, or sunlight, shining on the battery is to be avoided. A subdued light is better.

No matter what system of brooding is followed records should be kept. A most useful method is to have a card for the purpose, and to fix it either on the brooder or in the brooder house. When a chick dies, a stroke is placed on the line opposite its number. These strokes are counted up at the time the chicks leave the brooder, and a record is made, stating whether the chicks have been transferred and a record is filed in the office for future use.

Should the chicks bear any particular mark, a record of the mark the dead chick bore should be made thus:—
Died in rearing, *red*, .↑, ↑., *green*, which shows that a chicken with a red ring died, others with outside left and outside right toe punches, and another with a green ring also died.

A commercial poultry farmer in a big way must know his mortalities year by year. They show him so many things. Possible faults in breeding stock, in incubation, in feeding, in brooder management, also which hens give the unlivable chicks, and which give the greatest percentage of cockerels or pullets. All such items are of the greatest importance to the progressive poultry farmer.

Just as there are many roads to one capital, so are there many methods of chick rearing, and to enumerate them all would be a hopeless, as well as a useless task. The fundamental rule in rearing is to know the exact aim for which the bird is being reared—then to put into operation all knowledge to accomplish this end.

Generally speaking, rearing may be divided into three classes:—

(1) Rearing for laying purposes; (2) rearing for table; (3) rearing for exhibition.

(1) This method is not to produce mere size, but rather to develop the egg-producing organs and moderately early maturity. (2) Here the aim is the greatest growth of flesh in the shortest possible time. (3) In this system immense bone, profuseness of feather or smallness of stature may be the desired objects.

It is our intention to deal with:—(1) The wet mash method; (2) Dry mash; and (3) Battery brooder mashes. The specially intensive method will be covered in the dry mash notes.

Semi-Intensive Feeding

As a wet mash for semi-intensively reared chicks for the first four weeks use the following:—1 lb. Sussex ground oats; 1 lb. maize meal; ¾ lb. meat-and-bone meal; ¼ lb. dried milk; 3 lbs. weatings; 1 lb. bran; 2 ozs. mineral matter (or 1 oz. table salt to every 7 lbs. mash) and 2 ozs. cod-liver oil.

From the fourth to the twelfth week:—1 lb. Sussex ground oats; 1 lb. maize meal; 1 lb. meat-and-bone meal; 3 lbs. weatings; 1 lb. bran; 2 ozs. mineral matter (or salt amount as above) and 2 ozs. cod-liver oil.

From the twelfth to the twenty-fourth week:—1½ lbs. Sussex ground oats; 1½ lbs. maize meal; 1 lb. meat-and-bone meal; ¼ lb. bone meal; 3 lbs. weatings; 1 lb. bran and 1 oz. table salt to each 7 lbs. of mash.

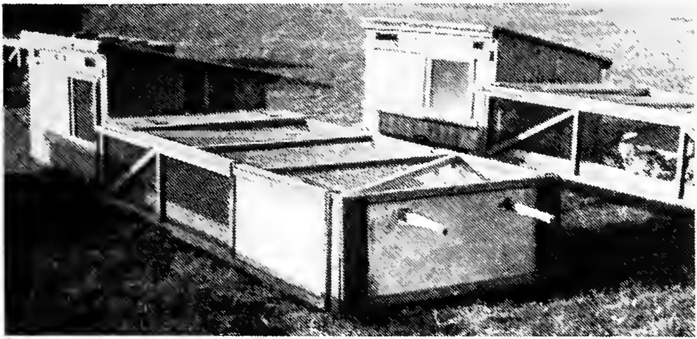
The number of meals per day and the grain ration are the same as for intensively kept chicks.

Voting is always in favour of allowing water from the first day to all kinds of poultry, except in cases of fattening. There can be no ill-effects in stock from so doing, so long as a full fountain has always been kept before the birds.

Unless chickens could be kept entirely on insect matter and grub life and succulent green food—which are roughly 70% to 90% water, and which they could obtain under natural conditions—the contention is that they should have water. A little finely-chopped green food is beneficial to all chicks.

The dry mash system for intensive rearing is a subject that could easily be expanded more than is possible to give in this work.

Here the term " intensive " means that the chicks are being kept on some kind of artificial floor and entirely in sheds or indoors. Rearing under such conditions means that they cannot obtain anything for themselves, and every requirement must be met in the food provided for them. Thanks to scientific discoveries of late years, this can be done.



Here is another portable type of outdoor brooder. In this case, however, the chicks are restricted to the run part. Handles at either end make removal to fresh spots easy. Brooder end accommodates a small 50-75 chick oil-heated hover

As chickens being reared in this way have no other occupation but the obtaining of their food, it is better if their food is of such a nature that they may have it before them all day and be adequately fed, without overfeeding. For this reason certain things are incorporated into their mashes with the idea of providing bulk, and it would be very unwise to have *any* ingredient out of a mash without an expert's reason for so doing.

" Dry mash " means that all the meals given in the formula are mixed together in a dry condition, and are fed in that state.

Success with dry mash feeding depends on the water supply. A chicken eats a few mouthfuls of mash, and then has to wash it down with a drink of water. It is obvious, therefore, that when the water vessel is empty, dry mash cannot be made full use of. The chickens should never be without water during the hours they are supposed to be feeding.

The water should be supplied from a tap, or spring, and must be absolutely pure. If caught or pond water has to be used, then something will be needed to ensure its being used with safety, for we must recognise that such water may contain the very organisms from which we wish the chicks to escape, such organisms as produce coccidiosis and dysentry, gapes, etc. When there is any doubt about the purity of water supply, boiling is the best method of dealing with it.

Dry mash for first three weeks:—1 lb. bran; 1 lb. Sussex ground oats; 1 lb. maize meal or maize germ meal; ½ lb. dried milk; ½ lb. meat-and-bone meal; ¼ lb. alfalfa; ¼ lb. charcoal; ¼ lb. yeast meal; 2¼ lbs. weatings; 2 ozs. mineral matter and 2 ozs. cod-liver oil.

From the fourth to the ninth week (inclusive):—1½ lbs. bran; 1½ lbs. Sussex ground oats; 1 lb. maize meal or maize germ meal; ½ lb. dried milk; ½ lb. meat-and-bone meal; ½ lb. alfalfa; ¼ lb. charcoal; 6 ozs. yeast meal; 2½ lbs. weatings; 3 ozs. mineral matter and 4 ozs. cod-liver oil.

Meat and Bone Doubled

From ten to sixteen weeks (inclusive):—2 lbs. bran; 1 lb. Sussex ground oats; 1 lb. maize meal or maize germ meal; 1 lb. meat-and-bone meal; ¾ lb. alfalfa; ¼ charcoal; 6 ozs. dried yeast; 3 lbs. weatings; 4 ozs. mineral matter and 4 ozs. cod-liver oil.

From sixteen weeks to the laying stage:—2 lbs. bran; 1 lb. Sussex ground oats; 1 lb. maize meal or maize germ meal; 1 lb. meat-and-bone meal; 1 lb. alfalfa; ¼ lb. dried yeast; ¼ lb. charcoal; 3 lbs. weatings; 4 ozs. mineral matter; 4 ozs. steamed bone flour and 4 ozs. cod-liver oil.

The usual grits used in chicken rearing are flint or quartz or lime-stone grit. The purpose of giving them is to supply something with which the chick can grind the food it swallows; remember the chicken has no teeth. It should not be thought that when mineral matter is supplied grits are unnecessary, or *vice versa*. Chicks are reared without grit, but my experience is that for the proper development of the gizzard, grit is needed.

Mineral matters are a collection of substances ordinarily found in foodstuffs in small quantities. As some of these are lost in the grinding of foods, the loss has to be made up. Though small in amount, they are extremely valuable, but the supply should not be overdone, and the prescribed quantities must be faithfully adhered to in mixing the mashes.

A good mineral mixture can be made up as follows:—50 ozs. steamed bone flour; 23 ozs. powdered limestone or powdered chalk; 20 ozs. of common salt dried and well crushed; 5 ozs. of flowers of sulphur; 2 ozs. of oxide of iron and ¼ oz. of iodide of potassium.

The above mixture is given in ounces for the sake of people having only small flocks of chickens. The ounces can be converted to pounds if necessary, but care should be taken that the ¼ ounce of iodide of potassium does not exceed four ounces per 100 pounds of mixture. As the potassium iodide is such a small amount, it is better added to ½ pint of water and sprayed over the mixture; the mixture should be repeatedly turned over and sprayed with the iodide until all the liquid is used. The four ounces should be added to half-a-gallon of water when mixing up the 100 pounds.

Semi-Intensive Dry Mash

With the semi-intensive system it is taken for granted that the birds are allowed a certain amount of range. This means, of course, that advantage can be taken of natural foods and the mashes are made up to blend with what the chicks will find on their range.

For the first three weeks:—1 lb. bran; 1 lb. Sussex ground oats; 1 lb. maize meal or maize germ meal; ½ lb. dried milk; ½ lb. meat-and-bone meal; ¼ lb. alfalfa; ¼ lb. charcoal; ¼ lb. dried yeast; 2¼ lbs. weatings; 2 ozs. mineral matter and 2 ozs. cod-liver oil.

From the third to the ninth week (inclusive):—1½ lbs. bran; 1½ lbs. Sussex ground oats; 1 lb. maize meal or maize germ meal; ½ lb. dried milk; ½ lb. meat-and-bone meal; ¼ lb. alfalfa; ¼ lb. charcoal; ¼ lb. dried yeast; 2½ lbs. weatings; 3 ozs. mineral matter and 3 ozs. cod-liver oil.

From ten to sixteen weeks (inclusive):—2 lbs. bran; 1 lb. Sussex ground oats; 1 lb. maize meal or maize germ meal; 1 lb. meat-and-bone meal; ¼lb. alfalfa; ¼ lb. dried yeast; ¼ lb. charcoal; 3 lbs. weatings; 2 ozs. mineral matter and 2 ozs. cod-liver oil.

From sixteen weeks to laying stage:—2 lbs. bran; 1 lb. Sussex ground oats; 1 lb. maize meal or maize germ meal; 1 lb. meat-and-bone meal; 1 lb. alfalfa; ¼ lb. charcoal; ¼ lb.

dried yeast; 3 lbs. weatings; 4 ozs. mineral matter; 4 ozs. steamed bone flour and 2 ozs. cod-liver oil.

To conclude this chapter, two specimens of battery mashes are given which are well designed for their special purpose, and show the kind of thing required for this class of work. It should be noticed that grain is rarely fed in conjunction with these mashes, sometimes a little is sprinkled in the dry mash feeders, but then only once each day after the birds are three or four weeks old. The mere composition of a mash, however, can only go hand in hand with the temperature of the brooders and the conditions under which they are being run, and it is impossible to give a system of diet that would be suitable under all conditions. A really good mash could not support life in the birds if other necessary conditions were faulty.

Dry mash for the first four weeks:—1½ lbs. bran; ½ lb. alfalfa; 1 lb. maize meal or maize germ meal; 1½ lbs. Sussex ground oats; 3 lbs. weatings; ½ lb. meat-and-bone meal; ½ lb. dried milk; ¼ lb. dried yeast; ¼ lb. charcoal; ¼ lb. steamed bone flour; 2 ozs. iodised mineral matter and 3 ozs. cod-liver oil.

Fourth Week and Onwards

From the end of the fourth week and onwards:—2lbs. bran; ½ lb. alfalfa; 1½ lbs. maize meal or maize germ meal; 1½ lbs. Sussex ground oats; 3 lbs. weatings; ¾ lb. meat-and-bone meal; ½ lb. dried milk; ¼ lb. dried yeast; ¼ lb. charcoal; ¼ lb. steamed bone flour; 2 ozs. iodised mineral matter and 4 ozs. cod-liver oil.

In each case where cod-liver oil is given it is better, in order to ensure the oil being well spread over the whole mash, to mix it well into the meat meal before adding the other meals.

It has not been possible to deal with every type of rearing in this chapter. What has been done is to select those methods that have proved consistently satisfactory over a period of years, leaving the entirely experimental systems to those who have time and patience for this class of work.

All that need be added is that if neither of those that are given is similar to that used by the reader, and provided your results are satisfactory, there is no need to change.

CHAPTER VIII

SEXING DAY-OLD CHICKS

TO be able to discern the sex of any breed of chickens as soon as they are hatched is an achievement which has economic advantages, and to the Japanese the credit of this discovery is usually granted. Some of the earlier names associated with it are those of Hashimoto, Kojima and Sakakijama.

Sexing was soon taken up in America where H. L. Shrader, W. H. Burrows and J. C. Hammand, added, with slight variations, to the general knowledge of the subject, and the late Michael Phelan, who believed that a Britisher could do it just as well as any other Nationality, helped to distribute the knowledge widely in Great Britain. Mr. W. P. Blount, the British veterinary surgeon, brought the technique to a fine art, his method ensures the safety and comfort of the chick and a very high degree of accuracy for the operator. His method is fully recorded in "*Sexing Day Old Chicks.*"*

Skilful Handling

Just under the folds of the vent of a newly hatched chick a small projection or eminence is situated. This organ of a rudimentary nature disappears for ever within a week or ten days after birth. Upon its size and position, or upon its absence, it is possible to decide whether the chick is male or female.

A day-old chick is a delicate subject to handle, as anyone who knows the strength of the vitalene membrane which encloses the yolk will realise. If this is broken there is only one result, the chick dies. Therefore the method of handling the chick in order that the contents of the cloaca may be voided and the floor or inside of the vent made to appear through the vent in order that the lower fold may be examined, calls for not a little skill.

The vent is kept closed by a top lip which projects slightly over the lower, behind this is a space into which the intestines and ureters from the kidneys discharge, and a fold separates the rectum from this space, the cloaca. It is not the inner fold, but the lower outer lip of the vent that needs to be turned inside out so that the edge of it may be seen.

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* *Poultry World Ltd., Dorset House, Stamford St., London, S.E.1. (2s. 6d.).*

In the centre of this ridge lies the genital eminence. Although in the majority of cases the presence of the eminence denotes a male and its absence denotes a female it is also seen in a percentage of female chicks. Its position, shape and pliancy is then made the deciding factor.

It has already been written that a chick is a delicate subject to handle and this has, of course, given rise to the question as to whether sexing causes injury.

British sexers at work on newly hatched chicks. It will be seen that each is equipped with a powerful lamp and it is recognized that any changes in lamp power can lead to an increase in the percentage of errors. Guarantee of accuracy ranges between 90 and 95 per cent. and, as emphasized in this chapter, the main attributes of a good sexer are keen eyesight and nimble fingers. Once a monopoly of the Japanese, the practice of chick sexing has now spread to the extent that very few hatcheries are without fully trained and competent British sexers.

The answer is that in the hands of an inexperienced worker injury would be comparatively easy, but a fully trained sexer handles the chicks with such dexterity and speed that damage to any of its " internals " is highly improbable.

Blount, in his book, says: " It has been suggested that mere manipulation would be very liable to rupture the yolk sac within the abdomen of a newly-born chick, but in practice this should never occur. So far, in fact, we have never encountered a ruptured yolk sac in the laboratories, although my assistants and I have sexed hundreds of chicks."

He goes on to qualify this by the statement that the major organs which form the reproductive system are situated intra-abdominally. It must follow, therefore, that manipulation of the cloaca cannot envolve them or do any harm whatsoever.

The main attributes of a good sexer are keen eyesight and long nimble fingers. It is because of these that a greater percentage of British sexers belong to the fair sex. Other attributes are patience and the ability to make quick but accurate decisions.

The writer of this chapter was recently a guest at one of the very few chick-sexing "schools" established in this country. The word school has been quoted because it was established under unique conditions not entirely unassociated with the entry of Japan in the war. It was set up by one of our better-known Hatcheries for the sole purpose of training sexers for employment by that Hatchery.

Twelve boys and girls, ranging in age from 14 to 24, had received at the time of the visit approximately four months' training in the arts of sexing. They had long since passed that stage when they imagined all they had to do was to distinguish between the inverted cloaca of the male and female chick.

Not 12 but 300 !

Early stages of their training was restricted to blackboard work and very soon they found that it was not just a dozen different types of eminence which had to be memorised but any number up to 300. Neither did their training restrict itself to the structure of the abdomen of the chick; it became extended to a complete knowledge of the anatomy of the matured bird.

Some of their work may have appeared to them supernumerary to sexing, but their tutor knew her job and she knew that without anatomical knowledge her pupils would not grasp the importance of careful handling.

Training in sexing is not a cheap business. It is computed that many months of intensive work has to be put in and that thousands of chicks must pass through the hands of trainees before even the first stage of efficiency is achieved. A rough estimate of the cost would be in the region of £250. And chick sexers of the future must dispense with the thoughts that when they are capable of handling a mammoth incubator a day the world is at their feet.

It is perfectly true that fabulous sums were paid to the Japanese in the early days of sexing, but immediately the number of qualified sexers was increased so were their earnings decreased. Supply and demand must, at all times, dictate the scale of payment.

The Japanese are reputed to have had five years of solid practice before being sent abroad by their association and those who have seen them in their leisure time have been struck by the manner in which they take care of their hands. Regular finger massage, nails of a certain length, protective bandaging when work of a heavy nature is being done are only three of the precautions the Japanese are known to take.

While it has been written above that keen eyesight is an outstanding essential, Blount does not discount the use of artificial aids such as glasses and specially made lamps. So skilful is the operation, however, that he asserts that where a certain powered lamp is employed in the training it is essential to adhere to that power for always.

Predudice has Passed

This short chapter on sexing is not intended to serve as a medium for instruction. It is included mainly for the purpose of offering advice to those who imagine that the work is easy and that it can be picked up by anyone with a minimum amount of practice.

One thing is certain, it is that until complete mastery of auto-sexing by colour breeding has been attained, sexing has come to stay. Its introduction was received with a certain amount of scepticism but once the hatcher disposed of his prejudices, and the buyer did likewise, sexing went ahead with the fastness of a prairie fire.

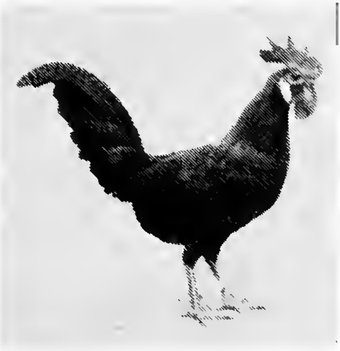
CHAPTER IX

SEX-LINKAGE AND AUTO-SEXING

PROFESSOR Punnett, after enquiry into the subject of sex-linked inheritance, arrived at the following conclusions:—When birds of certain colours were mated together, the females followed the colour of the sire, and the males the opposite colour, so that in certain crosses it was quite possible to know which were the cockerels and which were the pullets as soon as they were hatched.

Matings which first came under observation were those of the Duckwing Leghorn hens with Rhode Island Red male, the cockerels in this case were silver grey in the down, and thus easily distinguished at birth, the pullets on the other hand took on the Brown Leghorn colour, or biscuit colour with brown stripes down the back.

Matings of Black Leghorn male with Barred Rock females



SEX-LINKING WITHIN THE BREED.

GOLD TO SILVER CAMPINE.

In a limited number of breeds it is possible to sex-link without crossing. The Campine provides an excellent example. Gold male to Silver female produces golden pullets and silver cockerels. It has to be emphasized, however, that the offspring of such a mating, being a 50/50 mixture of gold and silver, will not sex-link.

produced chicks of which all the cockerels were marked with an occipital spot, that is, a whitish spot on the head, while in the pullets the head was entirely black. This spot occurs only on the head, not on the cheeks or other parts of the body, for both the sexes show lighter biscuit colour under the throat and abdomen, but there is no mistaking the head markings. Crossing Brown Leghorn males with barred females also produces cockerels with a white occipital spot and pullets with a black head.

There can be no doubt that the gold to silver mating is the most popular form of sex-linkage and, while it is possible that other breeds may be commercialized for this purpose in the near future, the outstanding pairing is Rhode Island Red male to Light Sussex female.

It is interesting to record that this 100 per cent. accurate sex-link would, if the mating were reversed (i.e., Light Sussex male to Rhode Island Red female), throw an amazingly high percentage of pullets that are almost indistinguishable from pure Light Sussex.

All are Gold Males

In addition to the Rhode the following are accepted "gold" males: Barnevelder (both Partridge and Double-laced), Black-Red and Brown-Red Game, Brown and Buff Leghorns, Buff and Partridge Cochins, Buff Orpington, Buff Plymouth Rock, Golden Hamburghs, Wyandottes and Campines, Indian Game, Partridge Wyandottes, Red and Speckled Sussex, Redcap, and Brown and Golden Buttercups. There are, of course, other lesser-known breeds.

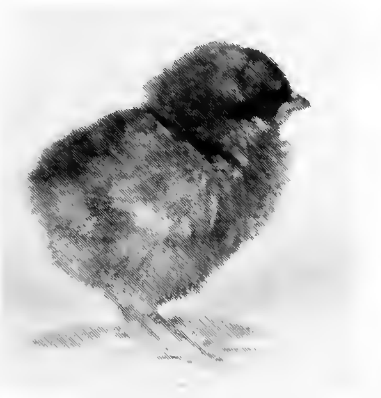
Choice of females is not so large. Here are some of them, in addition to the Light and White Sussex: White, Columbian and Silver Wyandottes, Silver-Grey Dorking, Silver Duckwing Game, Silver Duckwing Leghorn, Light Brahma, Silver Hamburgh and Silver Campine.

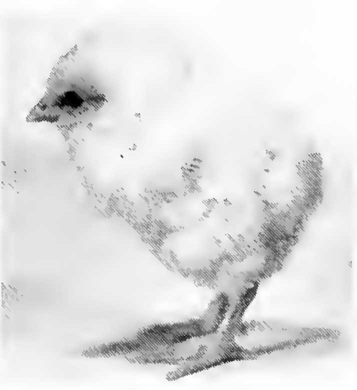
It will be noted that an absentee from this list is the White Leghorn. Reason for this is that this variety is a "sport" from the Black and is not, therefore, a true silver.

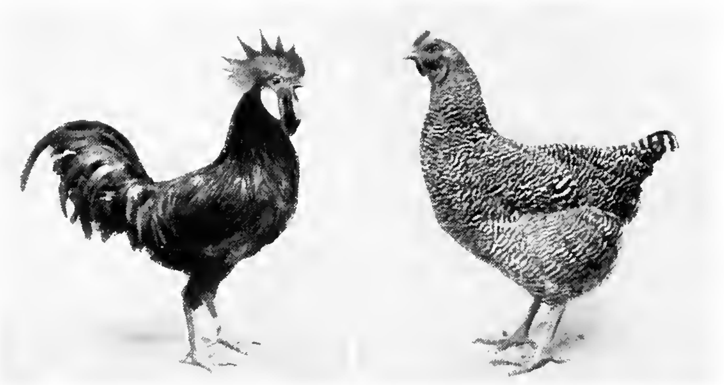
Any of the above males can be mated with any of the females, and the sex distinction will be in the down and plumage, the females will always have the buff or golden down colour, with or without reddish or dark brown markings. The males will take the white or silvery white, or pepper and salt down colour, which may be accompanied with almost black markings, but the prevailing colouration will be white or silvery white.

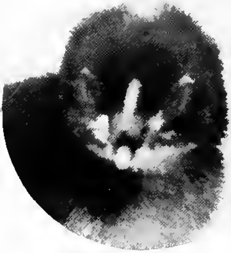
GOLD TO SILVER SEX-LINKAGE

Rhode Island Red male (above) mated to Light Sussex or White Wyandotte females (right) offer the most popular form of sex-linked breeding. The progeny chicks of either mating are seen below. The golden chick (left) is the pullet while the silver chick is the cockerel. It will be observed that there is a complete reversal of colour, namely, golden parent male breeds silver cockerel chicks; silver parent female breeds golden pullet chicks. A reversal of the mating—silver male to gold females—does not give sex-linkage.



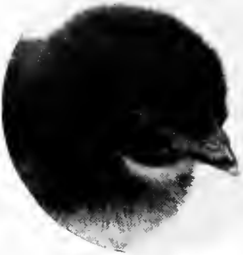


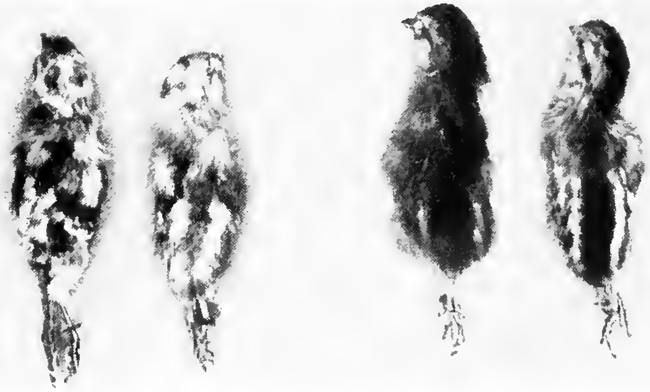




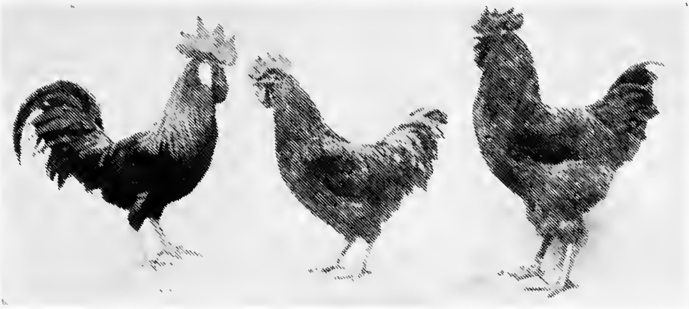
OCCIPITAL SPOT MATING.

This is a typical pairing which will produce cockerel chicks (left) with a white spot in the centre of the head and pullets (right) with a solid black cranium. The cockerel used is a Black Leghorn and his hens are Barred Plymouth Rocks. As stated in the opposite page there are several black-barred matings.





Here are some patterns common to down colour in auto-sex breeds. Those on the left are cambar pullet chicks. On the right are chicks common to the partridge or stippled type of marking as in Barnevelders and Welsummers. Auto-sexing is, of course, still in its infancy and down colours are not yet fully standardised



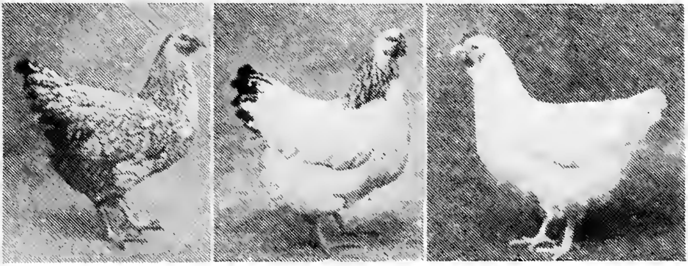
Gold cockerels for sex-linked breeding include these three. Left : Brown Leghorn ; Centre : Partridge or Laced Barnevelder ; Right : Buff Plymouth Rock

There can be no denying the fact that the more simple form of sex-linkage has come to stay and it is a pity, therefore, that two or three crosses continue to hold the monopoly. The photographs on this page show some of the less popular breeds and varieties which would, without doubt, provide excellent " sex-links."

Take the Brown Leghorn male as an example. Used with Light Sussex hens this was one of the earliest crosses, yet nobody seems to have tried it out on Silver or Columbian Wyandottes, nor on White Sussex or White Plymouth Rocks.

Another cross which commends itself is Barnevelder male on to Light or White Sussex females; this should, in fact, prove an excellent brown egg cross.

With black cocks and barred hens, the sex distinction is known by the occipital spot (a whitish spot on the head)



And here are three silver hens. Left to right : Silver-laced Wyandotte (from which the White is a " sport "), Columbian Wyandotte, and White Sussex (a " sport " from the Light) which denotes the males, the pullets are black right over the head.

BLACK COCKS	BARRED HENS
Australorp	Barred Rock
Leghorn	Barred Dominique
Langshan	Cuckoo Leghorn
Minorca	Crele Game
Orpington	Scots Grey
Rock	

A further mating is of dark shanked cocks to light shanked hens.

DARK SHANKED COCKS	LIGHT SHANKED HENS
Australorp	Barred Rock
Black Minorca	Buff Rock
Black and White Breese	Brown, Black or Buff Leghorn
Buttercup	Light Sussex
Campine	Scots Grey
Hamburgh	White Wyandotte
Langshan	
Willow Legged Game	

With the above matings, the sex-linkage is shown by the colour of the shanks, usually the cockerels will have light shanks and the pullets dark ones, which means reversal of the shank colour. There are some strains of White Leghorns which will sex-link with a dark shanked male, and some readers may like to try this, but it is as well to try if they do answer the rule before trusting to it extensively, pullets should have dark shanks and cockerels light shanks. Sex-linkage can be applied to some breeds of ducks, but there is not a general call for it in this direction.

To those desirous of keeping a first cross for laying purposes, and anxious to devote the whole of their space to rearing pullets, the question of sex-linked inheritance will appeal very strongly.

In recent years what are known as auto-sexing breeds have made their appearance; these also have been "made" by Professor Punnett. Auto-sexing is actually sex-linkage without the necessity of crossing; auto-sexing breeds are, therefore, pure. Examples are the Cambar and the Legbar. Others are fast nearing completion and all of them sex on a barring principle, hence the second half of the name—bar. First half usually denotes the predominating breed used in making the variety. Thus Cam would indicate Campine and Leg the Leghorn.

Judging from the number of auto-sexing breeds to have already made their appearance there seems to be no end to them—latest introductions are probably the Dorbar and the Brockbar, in the making of which the Dorking and the Buff Rock were employed. But despite the attraction of auto-sexing the commercial side of the industry has yet to take kindly to them.

It is an open secret that the discovery of auto-sexing was made by accident. Professor Punnett was working with Mr. Michael Pease on experiments to discover the relationship between different types of barring. Crossings were made between the Campine and the Barred Rock and only those birds in the progeny that showed the Rock barring were persevered with.

Two Distinct Down Colours

It was noticed that after a few generations of crossing the chicks came with two distinctive types of down colour and further investigations showed that the darker chicks were pullets and the pale ones cockerels. From then on the experiments took on an entirely new character and shortly afterwards the Cambar made its bow to the public.

Egg size caused not a little concern in the early stages of the standardisation of the Cambar, but judicious crossings with other breeds, without destroying the auto-sexing factor, soon brought about a marked improvement in size.

With the Cambar firmly established experiments were next centred upon the Legbar. This addition, to use Mr. Pease's own words, was made as follows:

A Gold Cambar hen was mated to a Brown Leghorn male, the barred cockerel chicks from which were marked by the light head patch from the Cambar mother. The next matings were some of these cockerels to pure Brown Leghorn females, a crossing which produced barred and non-barred offspring in both sexes. Once again a barred cockerel was mated to Brown Leghorns to establish the pure striped brown down.

In the fourth mating barred males and barred females were used and a new type of down appeared; in colour it was much lighter and it provided the pure Legbar male for mating with the corresponding females. Successive matings found the characteristics firmly fixed.

In the finished state the Legbar pullet at hatching time carries a brown stripe down the light head patch and, when matured, is not unlike the Brown Leghorn except that its feathers are softly cuckoo marked. The Legbar cockerel chick has straw-coloured washed-out down at hatching time.

Biggest claim of the auto-sex enthusiasts is that when present strains of their breeds are worn out it will be a simple matter to re-make them in their entirety. Second time round the task will be freed of experimental matings that proved unsuccessful in the preliminary stages, provided, of course, that the original breeds used in the make-up are still in existence!

As with sexing by the Japanese principle sex-linkage and auto-sexing have, as their main advantage, the possibility of reducing the number of males that are carried on to maturity. The breeder can put aside, near enough, his requirements and the remainder are disposed of at hatching time.

Unwanted Cockerels

This disposal of cockerels has, of course, given rise to many problems and, until steps were taken which certainly minimised a nefarious practice, many thousands of them were sold as as-hatched chicks. Certainly they were as hatched, but as-hatched does not mean unsexed. The Poultry Advertisement Control Board, a body set up by the Specialist Poultry and Agricultural Press, was first to move. The term as-hatched was forbidden in any chick advertisement appearing in papers under the control of the Board and stringent rules were adopted which clarified the sale not only of day-old chicks but also of growing and matured birds.

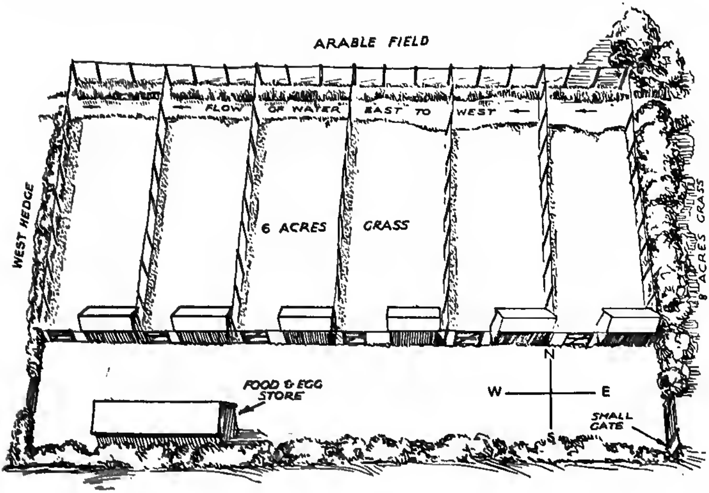
Despite all the work that has been done to keep thousands of cockerel chicks in their proper category it is still possible to buy boxed chicks on open markets without any indication being given as to their sex. For this reason the newcomer is strongly advised to restrict his purchases to reliable sources of supply—either direct from the breeder or from accredited or approved hatcheries.

CHAPTER X

DUCKS AND DUCK FARMING

ONLY in very rare instances would duck farming be taken in conjunction with poultry farming, for it is far better conducted as a separate business, since it is a business that requires a rather different class of man from that required for poultry farming, and certain natural conditions to make a success of it.

The great bugbear poultry farmers have always had to contend with has been tainted land, and as the majority of them have to manage with rather less land than they would like, ducks, which taint land far more quickly than any other class of poultry, would not be advocated. Therefore, when the holding is a small one, under five acres, few advisors would recommend much in the way of duck-keeping, and if any ducks be kept, it should be with the idea of keeping together a private trade rather than to make much money from it.



Here is a suggested lay-out for a duck farm's adult laying and breeding flocks as given by Reginald Appleyard in his book "Ducks" (Poultry World Ltd.). Apart from the stream it is a man-made layout.

Stock ducks require a house with a good boarded floor, and it is often necessary to have small mesh wire netting underneath this in order to be secure from their inveterate enemy, the rat. It is better for the door to open flush with the floor of the building as ducks are so easily injured if they have to climb anything in the way of steps. When the floor has to be raised to render the apartment waterproof a broad gangway should be used with strips of wood across every two inches to prevent slipping, and the gangway should be the full width of the doorway.

The usual small round hole through which the ducks are supposed to " loop the loop " is not by any means up-to-date, and two doors after the style of a coach house that can be flung wide open to allow of the whole being swept out easily are the best form of ingress, or egress.

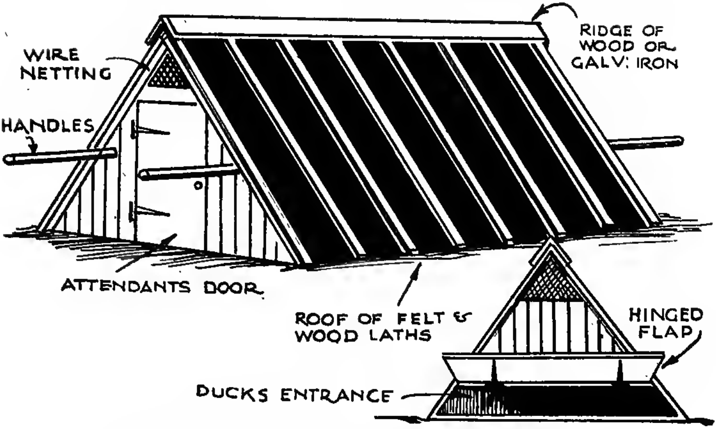
The doors should be made to hook to a post so that they can be kept open the whole of the day. In the matter of nest boxes the duck is somewhat difficult to please, usually laying its eggs in the litter and covering them from sight.

With and Without Housing

Broadly speaking, there are two methods of rearing ducks for market purposes, one is with housing, and the other is without, and it would all depend on the climatic aspect of the district as to which system should be adopted.

At one of the most successful duck plants in the world the ducks are reared in the open after they are old enough to leave the foster mother. There need be no permanent fences on a duck farm of this description, netting 18 inches in height and of inch mesh should be bought in rolls, and thin stakes anything from 2ft. 6in. in length which are driven into the ground with a mallet are used for fencing. A fence is readily erected by threading the stake through the netting, and it is just as easily removed by rolling it all up after the stakes are pulled out of the ground. This method is a great convenience when changing the ground, which is very necessary in duck farming.

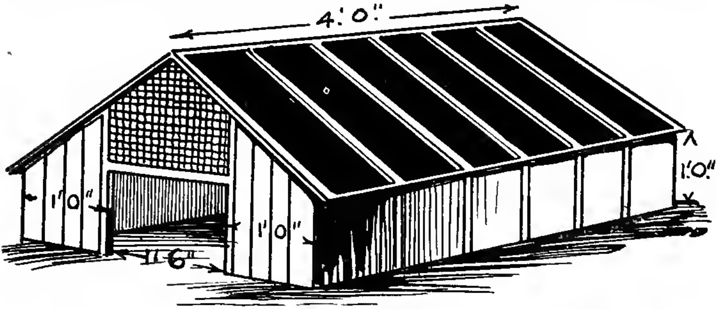
Two fifty-yard rolls will thus construct a pen 25 yds. each way in which about eighty ducks can be reared to maturity. As a rule ninety or so are placed in such pens or the batch from a hundred-egg incubator, but, through mortality, they are generally reduced to not much over eighty before the market age is arrived at. It naturally follows that this system of rearing can only be adopted during the warm months of the year and only then on fairly low-lying land



A useful Apex type duck house suitable for either laying or breeding stock. Its portability is an added feature of its utility.

which has some protection from strong winds. A large number of these pens could be mapped out, leaving a central passage through which a cart could pass and distribute water and food.

Another system is to have a long low shed with apartments about 10 feet in width and divided off by low partitions which one can step over. The partitions may be solid timber (two 9 to 12 inch planks stood on edge between stout uprights, fastened to the sides of the building so that they



A small and easily made portable shelter which can be accommodated in a duck compound where no other type of housing is employed. It also serves as a shelter for young ducks on the rearing ground.

can be easily removed for swilling down), or they can be simply wire netting, but for many reasons creosoted boards are to be preferred.

Size of the pens should be graded, the first being five or six feet and the others graduated up to 10 or 12, so that the ducks can be moved up as they grow. On the indoor system, about fifty in a flock give the best results.

The young ducks should be started off in the smaller pens and gradually moved up; in fact, if need be, the foster mother can occupy the first compartment, thus making the unit complete in itself. Where more ducks are required than this unit would accommodate, several on the same plan might be arranged in close proximity to each other.

Small outside runs could be placed back and front of this building, so that the broods could be taken through without occupying one run twice in a single season. The outside runs could be made either moveable or permanent as the owner desired. Movable ones are best, because after each duck season both front and back runs can be ploughed up and sown with rape seed or rye or some other green crop to sweeten it.

Newcomers to duck farming will search in vain
taken on one of Britain's largest duck ranches. A
have never seen swimming water, and they ar
Pennine duck, a fast-growing

Another system is to lay the outside runs with gravel (rolled hard) or to have a tiled or cement floor, and allow the ducks on this paved portion for feeding and watering, taking care that these runs are drained to a channel on the outside of the place so that the whole can be swilled down with a hosepipe if necessary. The birds would be driven back to their sheds immediately after they are fed, and as the sheds would be bedded with peat moss, straw or some other easily removed litter, duck farming could go on in a sanitary manner for a lifetime without anxiety as to tainted land.

The position of the house should be as near to a pond or water range as possible, and when there is not one, the introduction of an artificial one is advocated. Ducks prefer to mate on water and,- where this is done, better fertility results.

sign of swimming water in this photograph
truth the ducks, which are mainly Aylesburys,
he worse for it. It was on this farm that the
ize table duck, was " made."

When permanent artificial ponds have to be provided they had better be composed of cement and the whole raised a couple of feet above the surrounding land, so that perfect drainage can be provided at one end of the little yard, which should be 10 by 6 as a minimum. A hollow cemented tank 18 inches in depth should also be provided; it should not, however, be the ordinary tank shape, but should slope gradually down to a flat floor from the sides so that the ducks can easily walk out without having to climb over any edges.

This little water bath should be at least 4 by 3 feet, and should be placed at the opposite end of the run from the house, so that a lot of the moisture will run off the ducks as they go along and not be carried into the pen. In the centre of this bath a fairly wide pipe and plug can be placed so that the water can be drained on to the land or into a vessel for removal. The pond would have to be filled from a water cart unless it were within easy reach of a hose pipe, which would be best, as the whole yard could be swilled down two or three times a week by this latter implement.

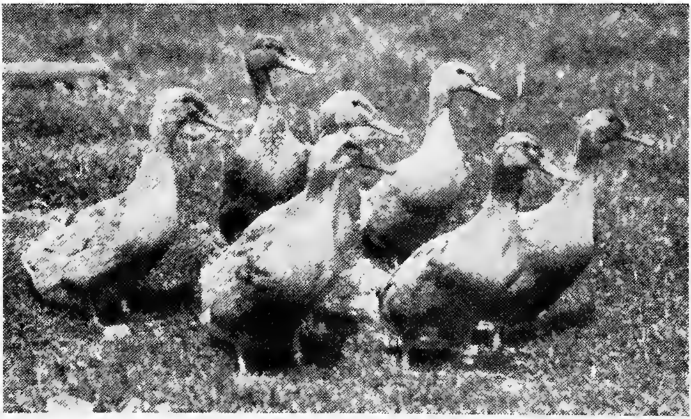
As this book is not devoted to ducks we come at once to the varieties for commercial purposes, which are Aylesbury and

Pekin, successful farms being run with either species, but by far the greater quantity of ducks which come to the market are a cross between the two. Which way they are crossed is immaterial except that perhaps Pekins lay most eggs, and crossed with an Aylesbury drake a good team can be got together. About four ducks to a drake is the usual number.

The best ducks for egg production are Khaki Campbells, Indian Runners and Buff Orpingtons. The White Campbell, a sport from the Khaki, is also an excellent producer.

As has been pointed out in the photographs on pages 92-3, swimming water is not an essential as far as laying ducks are concerned. It is, however, conceded that better fertility results if the breeders have access to water.

A stock duck should be a good weight, for large young ducks cannot be expected from small stock ducks. Full growth may be said to be obtained when the wing feathers cross each other over the stern; once they touch each other they are practically ready, and from that stage onward until the wing feathers are so long that they cross, is the utmost limit they should be kept or they will drop into moult, which is fatal from the profit point of view to the table duck-



Khaki Campbells have made a wonderful name for themselves as layers and have ousted the Indian Runner (the egg-a-day duck) from the top rung of the ladder. The ducks in the photograph led a section at the Harper Adams Agricultural College Laying Trials.

An orchard range is ideally suited to ducks. They are wonderful foragers and will play a great part in the destruction of insect pests. An additional advantage is, of course, from the manurial viewpoint.

farmer. At that time a very small duck is better cleared out for what it will make, as it would be another ten weeks before it got into condition again.

It is possible to distinguish a duck from a drake by going behind them rather sharply, hustling them as it were, or trying to catch them; the ducks will emit a loud quack, but the drake has a thin poor tone. When old enough there will be the curled feathers in the tail to mark the drake.

For the early duckling business young ducks must be used, those hatched in February or March being the most suitable, but an old duck is not to be discarded, for she will lay in February and be in time for the majority of duck keepers. A good duck is prolific for three or four years. A good stock duck should weigh six to seven pounds and a drake seven or eight pounds, the greater weights are not particularly desirable unless the birds are very active and have a good range.

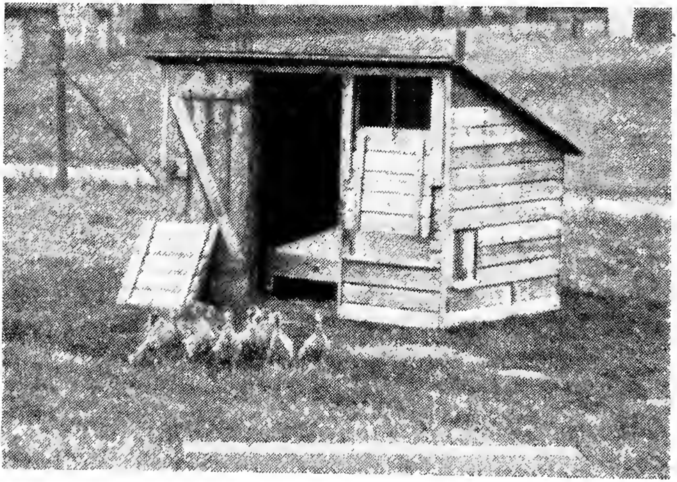
Young ducks can be grown from such parents to weights of four pounds at eight or nine weeks old, but the weight to be aimed at is an average of 4 to 4½ pounds at ten or twelve weeks; greater weights are obtainable, but we are writing of the average. Occasionally ten to twenty per cent. can be got off hand at eight or nine weeks if they have made exceptional growth.

In rearing ducklings it is necessary for the first week to feed every two hours: either

(1) Biscuit meal soaked in milk and given as it is, or dried off with oatmeal, or
(2) Finely ground barley meal and half as much again ground oats and weatings mixed into a crumbly condition with hot water and milk.

A little finely chopped green stuff should be sprinkled over the soft food, or on the water vessel. The water vessel should be such that the ducklings cannot get into it, but should be large enough for them to immerse their heads. Drinking water should, of course, be supplied from the first.

From one to four weeks old feed five times a day. All the meals should be soft food, and any of the following are suitable, though it will be readily understood that they may be varied, according to circumstances.



The six-by-four house comes into its own again. Here is one of these handy little appliances fitted out with a brooder and used for rearing a batch of Khaki Campbells. An ordinary oil-heated chick house is the appliance seen in the open door-way.

Feed as early, also as late in the day as convenient, arranging the meals as nearly as possible an equal distance apart.

(1) Scalded bran and biscuit meal, and as much again weatings with five per cent. meat and bone meal or fish meal.

(2) Bran, scalded with meat liquor and mixed with two parts weatings, one of oatmeal and ½ part meat meal.

(3) Rice is largely used in rearing the celebrated Aylesbury ducks. It is prepared as follows :—One pound of rice, 1½ pints of water, ½ lb of greaves; cook until water is absorbed. Mix with 2 lbs. of pollard, or middlings, or ground oats, and ½ lb. of maize meal. The "Paddy" rice is rice with the husk on, which can usually be bought at a cheap rate. The "greaves" are a dry meat product; "crissel" and granulated meat are similar in nature and can be used.

(4) One part cooked lean meat or fish, two parts bran, four parts weatings, and one of maize meal is another good ration. Fish offal, such as fish heads, shrimp husks, also sheep's paunches, are all cheap and useful foods, and can at any time be used in rearing table ducks. The rule with fish or shrimps is that they should be discontinued for a month before the duckling is marketed. Green food in some shape or form should be given daily.

From four to eight weeks old feed four times a day with any of the rations referred to, or now and then boiled wheat. Animal food is most essential, and fish heads (bones as well) can be utilised by being passed through a meat mincing machine. Sheep's paunches or pluck, or any waste table scraps, can be served in the same way; in fact, nothing need be wasted where a duck is kept. Skim milk mixed with the food rather lessens the amount of animal food required, so it behoves the duck raiser to see which fits in most economically. Three pounds of fish or meat can be allowed to every ten pounds of dry meals.

From eight to twelve weeks old give three meals only per day.

The market ducklings are now ready for fattening; future stock ducks should not, of course, undergo the fattening process. The largest ducklings can be sold off at eight to ten weeks old, some require a fortnight longer, but all market ducks should go at twelve weeks at the latest.

For these final weeks give either of the following mixtures :—

(1) Equal parts of Sussex ground oats, weatings and barley meal, mixed in dry condition in a bucket. Pour on a little melted fat (allow ¼ pint of liquid fat to every 5 lbs. of dry meal). Pour over the fat the scalding skim milk or other meat liquor, or hot water required to mix the whole into such a stodgy mass that it would turn out like a sand pie. Do not give until nearly cool.

(2) Boiled potatoes mixed with weatings two parts, barley meal one part, and some fat is another cheap fattening food.

(3) Ground oats and skim milk and a little fat with cooked rice.

Grain in the Water Trough

The mash may be given morning or evening. For the other meal grain, such as wheat or oats, or either of these, with cracked maize in the winter time. The grain foods are better given in a trough of water.

Even whilst fattening, a little green food tends to keep the birds in good order and the appetite well up to the mark.

Birds that are intended for stock purposes should be encouraged to lead a natural life and take to swimming as early as possible. At first their meals should be frequent, but less in quantity than the market ducks, so that they will range about more. After they are three months old, grain, such as good oats, may be given at night; if on a good water range they will only need a light breakfast besides.

In the majority of cases three meals a day are necessary for the best results. The noon meal can then be varied, either grain or soft food. The amount of animal food allowed must be governed by their owner. Needless to say, when there is a pond or stream with frogs, tadpoles, or young eels, no animal matter or fish will be required at all. We have known cases where it was necessary to allow the ducks on the stream for only two hours daily. It so teemed with young eels, etc., that nothing but soft-shelled eggs were laid whilst the birds had access to it. This was a very extreme case.

In mating the heavy varieties of ducks it is usual to allow only three ducks to a drake, whilst in the lighter varieties six ducks to one drake forms the usual " team."

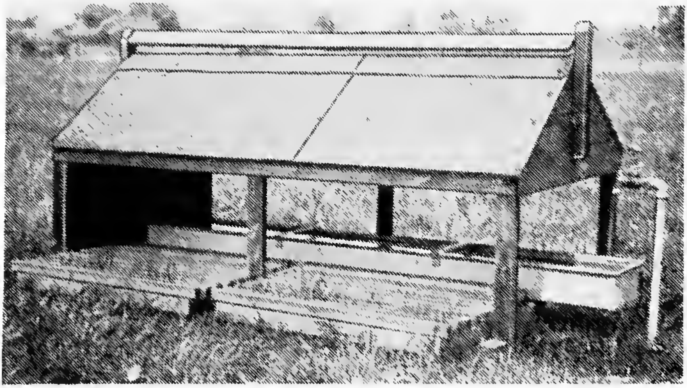
Multiple pens may be used if the range is a good one, that is to say 20 or more ducks with four drakes. Larger flocks of 30 to 50, with one drake to every 10, is also successful under some circumstances.

When ducks are kept specially for egg production, and with limited range and water supply, a properly arranged diet is necessary to produce the best results :—

2	parts by weight of	bran,
½	,,	short-cut clover,
1½	,,	meat or fish meal,
½	,,	maize meal,
2	,,	weatings,
½	,,	Sussex ground oats.

To which add 5% fine grit.

Whenever chopped *raw* green food, or green food and vegetable matter, turnip, etc., can be added, then up to 25% may be used instead of clover meal. The proportion would then be one pound of chopped vegetables to three of the mixed **meals.**



Ducks must be given plenty of drinking water, especially as grain is fed in their troughs. The ideal is a trough which permits them to immerse their heads completely and the arrangement in this photograph will commend itself to farms where sites are permanent.

Another good mash when the ingredients are available would be:—

Cooked or raw vegetable matter	1	part.
Cooked meat such as liver or sheep's paunches or lights	1	,,
Or cooked waste fish as long as *fresh*	1	,,
Maize meal	½	,,
Sussex ground oats	½	,,
Weatings	2	,,
Grit	5%	

Here are a few final hints for the duck-rearer:—

The water vessel should never be dry. The ducklings should have a trough of sharp sand or fine grit near the water trough to which they can help themselves at will. The ducklings should be kept nice and dry at night, and the less they are disturbed the better. Visitors should not be encouraged on a duck farm, and dogs not allowed about at all. Only a limited amount of water should be supplied while the ducklings are fattening. They should have a bath a day or two prior to being killed; this is very essential when no water range is available. Food should not be left about between the meals. Waste food from hotels is very excellent for ducklings.

Greedy for Moisture

In incubation duck eggs are "greedy" for moisture and a very common practice on farms where anything but force draught cabinet machines are used is to stand trays or buckets of water beneath incubators immediately the outside air becomes dry.

Where humidity for ordinary hen eggs may be as low as 65, and still present reasonable hatches, machines containing duck eggs should never be permitted to fall below 85.

Because of their natural roaming tendencies ducks should not be kept under semi-intensive conditions except where such a system is the only one available. Even then it is advisable to divide the runs so that one half is in use while the other rests.

TOP : A promising group of young Aylesbury-Pekin crosses of about nine weeks of age. If their owner's intention is to market them as early table ducklings he would kill and prepare at approximately ten weeks and before the youngsters grow their pin feathers
BELOW : A variety of duck that has yet to gain a large following—it is the Black East Indian and is mainly kept for ornamental purposes. Despite its lack of followers it is quite a good layer and a very passable table duck

Britain's most popular breeds of geese, Toulouse (top) and Embden (below). Bred in their pure state each of them make excellent weights and completely satisfy the Michaelmas and Christmas markets. Crossing the two, or using either as a cross on to other breeds, is a popular practice. The Toulouse-Embden cross is a great market favourite and it is possibly from such a cross that the Grey and the Grey-back came.

CHAPTER XI

GEESE AND TURKEYS

THE commercial poultry keeper will not be concerned with the antiquity of geese, except as they affect the pocket. That they are written of as far back as the B.C. era, will not trouble him, though the knowledge that the prominent men of that day were fond of the goose and the goose liver may be of interest. Most up-to-date book is "*Geese*," by Reginald Appleyard.*

The principal varieties (commercial) are:—The Toulouse, Embden, Canadian, Chinese or African. Standard weights and characteristics are :

	Sitter	Egg Production	Rate of Maturity	Weights Male	Weights Female
Toulouse	Practically non-sitter	Excellent	Slow	28 to 30	20 to 22
Embden	Good	Moderate	Rapid	30 to 34	20 to 22
Canadian	Moderate	Moderate	Medium	12 to 14	10 to 12
Chinese or African	Fair	Very good	Rapid	18 to 20	16 to 18

Characteristics of the Toulouse are:—Long, broad and deep in body, very prominent and deep breast, showing loose flap hanging from breast known as "keel." Broad in back, slightly curved from head to tail; very deep and square in stern, well spread tail, extremely deep "pouch" or bag. Short stout legs. Colour: Orange bill, dark brown or hazel eyes, orange legs and feet; dark grey plumage, rather lighter towards the thighs; back and wings dark steel grey, each feather laced with almost white lacing; flight feathers should however be grey and free from white; tail white, with broad band of grey across the centre. Horizontal body carriage.

The Embden is long and swan-like in neck; broad in body, very long in back, perfect freedom from keel, a full, well-rounded breast; clear under bill, no indication of gullet; straight back; deep paunch and broad stern. Fairly short legs; smart upright carriage. Colour a pure or creamy white.

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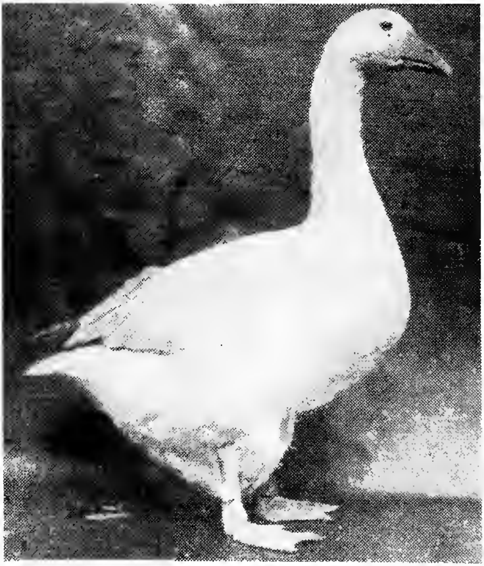
* *Poultry World Ltd., Dorset House, Stamford Street, London, S.E.1.*

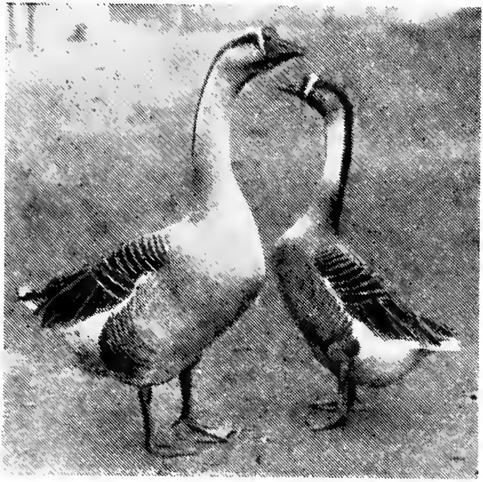
The African or Chinese is easily distinguished by the "knob" on the bill at its junction with the head. Upright in carriage, deep and fairly long in body, well rounded prominent breast; no keel, moderately deep in haunch; gullet should be prominent. Colour: Bill orange or dark brown, almost black; legs bright orange; knob usually dark or black; head, neck, and under parts yellowish grey, lighter towards the bottom of the breast and stern, where it finishes up practically white; dark brown stripe down the neck; back dark grey, almost a brown.

The Canadian goose carries a long body and neck which merges into a full breast, body getting gradually deeper towards the stern; no gullet. Colour: Head, neck and bill black, except for a crescent-shaped white patch, the horns starting from the backs of the eyes and going well under the throat; breast is greyish white; under parts pure white; flanks are a mixture of grey, black and white, black quills, and grey and white web; back and wings dark brownish grey, dark tail, light rump. Legs rather long, carriage upright.



Carrying far less keel than the Toulouse (see photograph on page 106) the Embden is described by Reginald Appleyard in his book on Geese as one of the most useful and sound varieties. It is, he says, hardy, vigorous, prolific, and generally gives excellent fertility combined with good hatchability and rearability. Moderate producers in spring and early summer the Embden reaches weights that are sometimes greater than those of the Toulouse.

Most prolific layers of all geese are the Chinese, which closely resemble swans in their outline. A peculiar characteristic of this goose is its knobbed bill and no matter with what variety it is crossed it passes this feature on. Two colours of Chinese are bred—the Grey, shown here, and the White. Although it is a popular goose it is strange that no standard for it has been drawn up.



Geese known as Greybacks are usually a cross between the Toulouse and Embden and are a particularly good market cross. They are, in fact, bred extensively in the Eastern Counties in place of pures. The farmers of Norfolk and Suffolk claim that Greybacks grow faster and do not carry nearly as much offal as either the Toulouse or Embden.

For breeding purposes one gander and three geese is the number that gives the best results, except in the case of Canadian geese which generally pair. Geese can be bred from for a great number of years, though they are considered at their prime between the ages of two and twelve years old. Young birds commence laying early in February, and lay practically the bulk of their eggs before the 1st of May. Late-hatched birds may lay much later in the season than this. The Toulouse gives anything from 15 to 50 eggs in a season. The Embden is, however, more disposed to lay the eggs in two batches, a small one of seven to eleven first, and from 10 to 15 or 20 at the second instalment. To get the greatest number of eggs from an Embden the best plan is not to allow her to sit on the first batch.

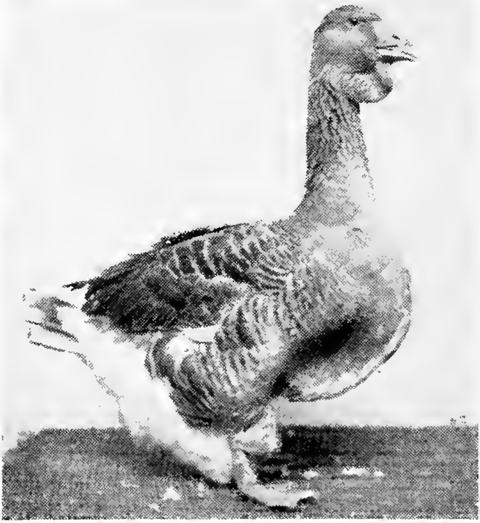
The Chinese, best producer of all geese, will lay several batches of 12 to 15 eggs in a season.

Goslings are hardy little things, provided, of course, that they have descended from healthy parents; but the progeny of fat geese, or those kept in very limited quarters, are very difficult to rear. Stock birds require rather different rearing from those intended only for market purposes.

For the first two or three weeks feed every two hours with any of the following soft foods, which may be varied as desired, the more changes the better :—

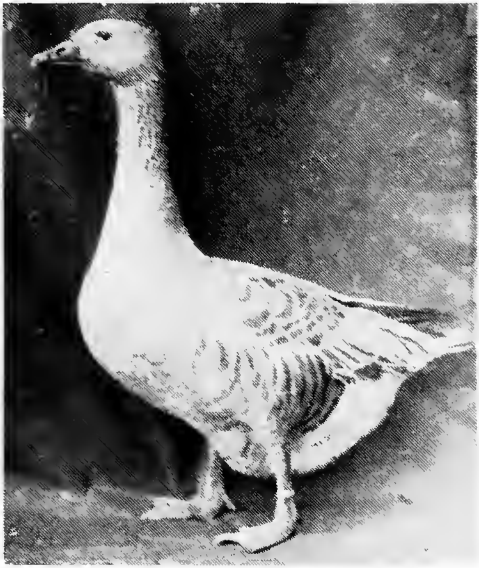
(1) Biscuit meal, scalded and allowed to cool, and given without any addition.
(2) Biscuit meal, scalded and dried off with weatings, or Sussex ground oats.
(3) Boiled cracked wheat, cooked in milk when possible and dried with oatmeal.
(4) Rice, served in the same manner.
(5) Stale bread crumbs and milk, given crumbly, not sloppy.
(6) Any of the soft foods advised for ducklings.

From then and until the goslings are four weeks old feed five times a day. Soft food should still be the staple fare. Equal weights of bran and biscuit meal, scalded and dried



Bracketed with the Embden as the oldest established variety of geese the Toulouse grows to massive weights. As the photograph shows this breed carries a very deep keel and, in exhibition specimens, this accentuates the accepted waddle of the goose. The Toulouse is widely used for crossing purposes. The Toulouse is an excellent forager and will, when on a suitable range, find much of its keep.

The Buff Goose has been produced by judicious crossings of a number of varieties and, while it is sometimes termed a "bantam" goose this is, perhaps, a misnomer when it is realized that matured Buffs weigh only a few lbs. less than the better known table varieties. The slight reduction in size has, without a doubt, added to the Buff's laying qualities.



off with weatings or ground oats. Or equal measures of bran, biscuit meal, pea meal, barley meal, and weatings. Or cooked rice or wheat, mixed into a crumbly condition, with ground oats and a little barley meal. Or cooked green vegetables three parts, bran three parts, maize meal one part, weatings two parts. Any of the above can be used as convenient.

From the fourth to the tenth week feed four times daily. The first three meals a day can be soft food; the last, grain. Any of the soft foods advised can be given, and for goslings that are going to market, potatoes and other vegetable matter can be added to the mash. Wheat, cooked in meat liquor and mixed with ground oats and barley meal, is excellent. Or any cooked vegetables (cook a little wheat with them), and bran; dry the whole off with two parts of weatings and one of maize meal. The vegetables may constitute one-third the entire mash. Malt culms or brewers' grains can be used instead of bran. Sound wheat, plump barley, or good oats are excellent for supper, and if these have been steeped in water all the afternoon so much the better.

Geese intended for stock should not be fattened, but when three months old allow them to forage for a great portion of their living. They will require very little soft food, which can be of the following description: Cooked wheat, bran, weatings, and a little pea meal, the whole mixed with skim milk or hot water, or meat liquor. In the absence of the latter a small quantity, not more than 10 per cent., of fish or meat meal is essential. Other mornings a moderate feed of oats may be allowed. The goslings should then wander at will during the day. On their return a good supper of oats or wheat should be allowed.

An indication of the huge quantities of grass that geese will eat is seen when barrow loads of lawn mowings are tipped on their range. While it is readily admitted that geese prefer to "cut" their own, they quickly dispose of the heaps thus offered to them.

At three months old market geese can be turned into the field, restricting them by hurdles to a certain portion if desired. It leads to better results to give a light meal of oats once a day, say at the time when their water vessel is attended to, for they will need water. Geese can also be profitably employed on the stubbles after the harvest is over, and in this case all they require is a trough of water and an occasional meal of soft food, plus a few heads of cabbage by way of variety.

The Fattening Process

When fattening geese feed three times daily. Christmas stock should be allowed three weeks for fattening. Good rough feeding will answer, such as three meals a day of cooked potatoes, a little bran steeped in meat liquor, and the whole mixed up with equal parts of maize and barley meal, and double the amount of weatings, sharps, or crammings. A little melted fat should be added, and this should be increased as the date of killing draws near.

Boiled wheat or oats, or good plump barley, will make an acceptable supper dish. For better class birds, ground oats and skim milk, and just a little barley meal and melted fat will be the best ration to use, and perhaps a good supper of stout white oats placed in the trough of water.

Goslings should not be kept on cement or greasy wooden floors, as both these conditions lead to serious leg troubles, unless adequately covered with dry litter to provide a good foothold. Drinking water is required from the first day and a grit trough should be somewhere near it. Goslings can be allowed to graze a field with sheep. They can do without a hen at ten days old. "Green" geese are young geese usually put up to fatten when eight or ten weeks old.

Goslings form strong friendships, and each lot should be kept together until killed; to separate or kill a few off would rather spoil those left. The young should be kept under cover in very wet weather. Goslings should not be allowed to stray far away from the coop for the first ten days.

The Embden-Toulouse cross is an excellent market cross, goslings of the year often reaching 20 lbs. weight, or over if hatched early in the season.

One variety of goose not previously mentioned in this chapter is the Buff (see photograph on page 107). This is more in the nature of a "bantam" goose and its introduction was made for the main purpose of fitting a goose to the small suburban oven. The Buff is, as yet, in its infancy but its originators do not hesitate to claim that for its size it is a fast grower and an excellent layer.

Turkeys for the Farm

Turkeys are a line that should not be attempted on small farms, though there is an increasing demand for them, and those farmers with a great acreage are the people whom it would pay best to cultivate them. The principal commercial varieties are the American Bronze, the Norfolk Black, the Buff and the White.

The American Bronze is the giant of the turkey family, with a standard weight of 36 lbs. for cocks and 20 lbs. for hens. These large birds are extremely deep in body, very full and well rounded in breast. The back is not straight, but curves gracefully to the tail. The wings should be very large and powerful. In the centre of the breast of the cock is a tuft, or beard, which should be very prominent. The tail droops almost to the ground. All turkeys have a peculiar head and neck, being covered with fleshy looking lumps, known as "caruncles." These in a young bird are at first grey in colour, until a certain age, when they turn red, and may be an intense red, or may fade away to a blue grey hue according to the health and temper of the turkey.

It has been abundantly proved that age has a great economic bearing on turkey rearing, as the turkey takes two or three years to mature properly. This is no mere fad, the practical reason being that the progeny of two years or older birds will weigh anything up to five pounds per bird more than the progeny from one year old birds, which apparently consume the same amount of food. With turkey flesh sold per lb. the financial aspect is worth considering.

The number of females to the male, or "Tom" or "Gobbler," varies with the individual and the extent of their range. With a good range up to 10 birds may be allowed, others prefer 6 to 8, the latter number is a safe average. The turkey hen or pullets may begin to lay in February, though late in March and early in April are the more usual times. A good average number of eggs is 20 to 30 per bird, generally given in two batches.

The first batch should be given to a hen to sit, and the turkey be restricted to a coop for a day or two until the desire to sit is broken, when she will commence to lay the second batch.

Age on One Side

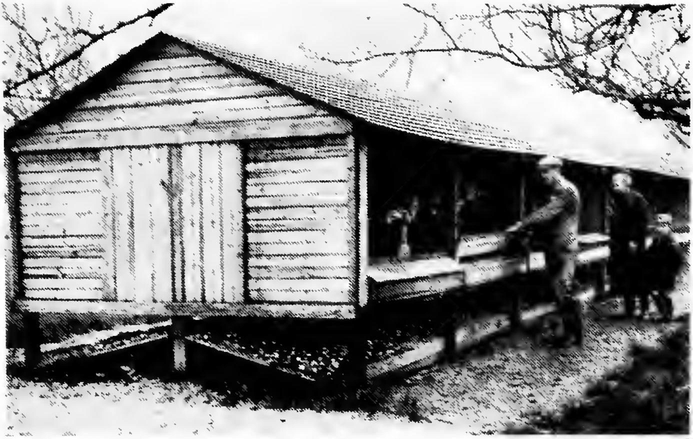
Sitting turkeys may be treated just the same as sitting hens. Some prefer to allow the turkey to choose her own nest, and place a floorless coop over her, which prevents her being disturbed, but as the nest may be at a distance the plan has its disadvantages. A turkey hen will rear a couple of broods (25 to 30 chicks), so that she might take the chicks hatched by a hen. The gobbler is best kept away, as some possess the cannibalistic propensity of eating the chicks, or the eggs from which they should come.

A good stock cock of 25 to 30 lbs. weight, and pullets 14 to 16 lbs., as a rule yield a good class of market stock. Endeavour to have age on one side of the pen, such as a two-year-old gobbler to poults or two-year-old hen to young gobbler.

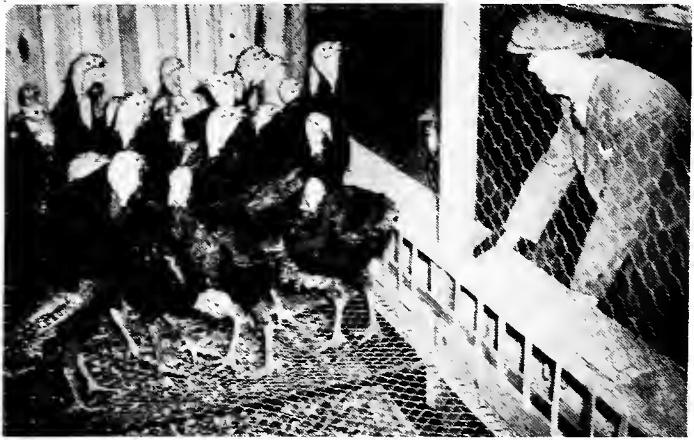
Green good, animal food and grit, are as essential to successful turkey rearing as they are to other classes of poultry.

The secret of getting young turkey chicks well on their feet lies in frequent feeding at short intervals during the early days of their lives. Although they may be hatched at noon, they need not be fed before the next day. As is well known turkey chicks are not apt pupils at meal times, and many breeders try to have a chicken or two ready, often by putting a few hens eggs amongst the turkey eggs after the latter have been set for a week. The chickens soon teach the young turkeys how to feed.

From one to three weeks old turkey chicks should be fed every two hours during the day, the first meal as early as



To combat coccidiosis and other ailments to which turkeys are heir, intensive rearing has gained in popularity. The photographs show the exterior and interior of a type of house widely used for this purpose. According to the requirements of the owner the house is divided into sections to enable the turkeys to be run in small groups. Stout wire or slatted floors, the former for preference, are employed and these enable the droppings, which are the main source of contact, to fall through to the sloping boards fitted beneath the house.



possible in the morning, and the last meal while there is just light enough for them to see to eat. There are many ways of feeding turkeys; most rearers prefer to use soft food. Begin the day then with a breakfast of soft food. All the following are good:—

(1) Stale bread crumbs, moistened with milk and dried with oatmeal.
(2) Biscuit meal, scalded with milk when possible, and then dried off with weatings or ground oats, or oatmeal.
(3) Milk curds, with water squeezed out. Very stiff oatmeal-porridge made with skim milk, and with oatmeal stirred in as it cooks until the whole is a thick, almost crumbly mass; give when nearly cool.
(4) Bread and milk, as prepared for chickens, is also a capital change.
(5) Rice, boiled with skim milk and rolled in oatmeal.

These provide a variety of suitable mashes, any of which can be used as opportunity offers, and the more changes the better.

Greenfood from Second Day

On the second day commence adding a little chopped green food to every meal; begin with a small quantity, and gradually increase as the chicks get older.

On the third evening, a few broken groats can be added to the last meal at night; then gradually a few more until at the end of three weeks the poults are having nothing but whole groats for supper. Small wheat or "dry feed" mixture can at any time be used in the same way as groats.

So far no mention had been made either of dandelions or onions; opinions are divided as to the giving of these. On the whole, the safer plan is to use tender grass or lettuce in preference to the stronger green foods. Turkeys will help themselves to dandelions, and when they are old enough to wander afield for them, let them have them if they wish. Dandelions produce a griping and frequent diarrhœa in some turkeys, more so at some seasons of the year than others, therefore both these and onions should be used with caution. Young nettles can be cooked and chopped and added to the soft food with advantage.

Give a little cooked meat at least once a day, especially if milk is scarce; in such a case the allowance of meat should be increased. Drinking water should be supplied in vessels that the turkeys can use without getting wet through, or standing in them.

From three weeks old feed the youngsters five times a day. Changes can be made when the chicks are at this age, for they will have grown, and can be given coarser foods, and less frequent feeding. But the longer the "dainties" are kept on with the better; at any rate do not stop them suddenly, let them down easily.

Soft food should still be the chief thing, and the daily dietary should be somewhat as follows :—

(1) Breakfast, scalded biscuit meal dried off with Sussex ground oats and weatings.
(2) Very stiff porridge, made with skim milk if possible.
(3) Any cooked green vegetables and meat mixed with ground oats or oatmeal and double the quantity of weatings.
(4) Rice and oatmeal, cooked until bursting, and crumbled with fine oatmeal, weatings or ground oats. Cook in skim milk or meat liquor when possible, and add a little meat meal to the mash. Wheat may be cooked in the same way and dried with oatmeal.
(5) Sound grain, such as wheat, groats, or buckwheat, or a larger grade "dry feed" mixture. As the birds grow, plump oats may be gradually introduced to the supper bill of fare. Now and then steamed wheat or broken maize makes a nice change. Give some meat meal or fresh-cut bone daily, especially if milk is not used.

Animal Matter Essential

From six weeks old feed four times a day. Breakfast: Any of the soft foods advised, always remembering that a supply of animal matter is an essential addition. Many things are available for this, such as cooked pluck, or any other butchers' offal; failing these, well-boiled dry meat or a good brand of fish or meat meal could be used. There is also fresh-cut bone, which is better given as a separate dish; used with discretion this has been found a very excellent promoter of size.

The second feed could be some dry grain in which wheat or buckwheat can with advantage be mixed. The third should be entirely soft food. The fourth meal, sound grain, wheat, oats, buckwheat, and cracked maize occasionally. It is, of course, anticipated that they will have found green food for themselves.

Future stock birds at four months old should be allowed all the range possible, and in many cases two meals per day will be quite sufficient; in such cases wheat and oats should be the staple grain. On limited range it may yet be advisable to give soft food, at any rate every other morning, and wheat or oats at night. But during the day they should forage for all else they require.

Market birds should still have soft food every morning, but might, with advantage, be allowed to forage during the day, and be given a good supper of wheat or stout oats on their return at night. Any of the advised soft foods could be used. When attempting to rear turkeys in rather limited quarters, such as a small paddock, a mid-day feed may be necessary.

All turkeys might be driven to the stubbles after the harvest, and so pick up their living for a few weeks, return-

As distinct from the intensive system the advantages of range rearing are emphasized in this photograph which shows a flock of Whites on the move. They are being taken from the stubblefield which they occupied after the harvest to quarters nearer home preparatory to the fattening period.

ing in time for some special feeding in readiness for the Christmas market. Stock birds must not be allowed to get fat, and in years when the grain knocked out of the ears of corn is considerable, the future stock birds would be better away from the stubbles.

Turkeys being fattened require three meals a day. For breakfast give ground oats and finely ground barley meal, mixed with skim milk, or three parts of cooked mashed potatoes, one part of ground oats, and one of fine barley meal, or two parts of weatings, one of barley meal and one of maize meal, along with three parts of potatoes. It is better to cook the potatoes with rough fat meat, or to use some skim milk in the mixing of them and the meals.

The noon feed can be a repetition of the above, or boiled wheat, especially if boiled in milk or meat liquor. Turkeys are very partial to very stiff oatmeal porridge. The evening meal may still be oats or wheat.

When turkeys are restricted to a barn for fattening, and only allowed out for an hour at meal times, two meals a day are sufficient, ground oats and skim milk being the staple, and to this add a little melted fat during the last fortnight.

Economy in "housing" could not be more clearly demonstrated than by this picture. Wide open spaces with nothing more than plenty of perch room has been the lot of this flock of Bronze Turkeys. Final stages in their career probably consists of nothing more than special fattening foods over a restricted period.

Properly fattened in this way, the flesh is beautifully white, and such birds command the best prices. In some districts it would not pay to fatten in this way, and then the coarser foods advised could be used.

For turkeys that are to be marketed, coarser and cheaper foods can be given. When cheap the despised potato can be used. Two parts of cooked potatoes, one part of biscuit meal, ½ part of pea meal, and one part of weatings will be found both useful and economical. It could be improved by a little rough meat being cooked with the potatoes and added to the food. In a like manner carrots or other vegetables can be used. Rice or wheat could be cooked instead of the potatoes.

Animal food in some shape or form is an absolute essential. The use of skim milk largely compensates for any shortness of animal food, and may even be used in lieu of it.

Watch for Heavy Rains

The mother of turkey chicks should be kept cooped until the chicks are a month to six weeks old. It is often necessary to drive chickens to the coop when a shower of rain is evident; until chicks are a month old heavy rains are in fact very destructive to them.

Turkey chicks generally run to shelter themselves after 6 to 10 weeks old. Extra care at this age is required, as it is a critical time in their lives known as "shooting the red," a term applied to the change of colours about their heads.

Turkey chicks can be reared much the same as other chicks, but more animal and green food is required while special care should be taken to keep them free from insects. They require a regular allowance of grit, which should always be placed in the vicinity of the coop. Turkey chicks cannot stand overcrowding in coops at any age, and they require dry, well-ventilated sleeping apartments.

A disease known as "blackhead" is possibly the greatest menace to turkey rearers. Chicks with this seem to thrive for a time, but go off rather suddenly. They can also give the disease to other chickens, so are better kept apart from other stock until a year old; the descendents of turkeys that have shown no sign of the disease at a year old usually escape, unless in contact with a new source of infection. It is very doubtful if the disease can be cured.

CHAPTER XII

AILMENTS AND PARASITES

INTENSIVE breeding of poultry has, unfortunately, led to an increase in the number of recognised diseases. An attempt is made in this chapter to classify the various troubles to which poultry are heir, but for a complete study of them the poultry-keeper is advised to obtain a specialised work like Blount's "*Poultry Ailments.*"*

Poultry keepers are only able to understand thoroughly the diseases of poultry if they first make a study of the anatomy and physiology of fowls. A sound knowledge of the anatomy of a bird, plus a full appreciation of the functions of the various organs are as much responsible for the success of poultry-farming as is the study of the make-up of breeding pens or the complete mastering of housing and feeding. Unfortunately the lack of this knowledge is striking in this most important branch of agriculture.

Nature Plays a Role

It is not absolutely essential that the poultry-man should be capable of conducting post-mortem examination on the carcase of a bird. What is, however, an incontrovertible fact is that he should be able to recognise, with speed, any of the diseases or ailments which may visit his flocks. Without this knowledge disaster may easily overtake him.

Strange though it may appear it is, perhaps, a good thing that disease has been permitted to reach its present proportions. Its incidence has done more than the written word could do—it has taught the poultry farmer that the hen is not a machine but a creation of nature. And those of us who make a study of nature know that she always permits a surplus of births with the full knowledge that there will be heavy premature deaths.

Nature starts her thinning-out process very early—the chick in the shell takes the first rap; how many dead-in-shell find their way to the pig food bin each year, and quite a good percentage of them are on farms where every precaution is taken to prevent their occurence. Even when the hatch is complete and the weakly ones removed there will remain a percentage that fail long before the weaning stage is reached.

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* *"Poultry Ailments," by W. P. Blount. Published by Poultry World, Dorset House, Stamford St., London, S.E.1.*

Nature does her work in ways which are sometimes crafty, but there are no half measures with her and, though she provides all the antidotes, the application of those antidotes is the task of the poultry-man. While she might allow a certain measure of latitude in most things she permits no serious mistakes to be made. It must be repeated, therefore, that not only is a knowledge of anatomy and physiology essential but that the poultry-keeper must teach himself to recognise the symptoms of not only minor ailments but also major diseases.

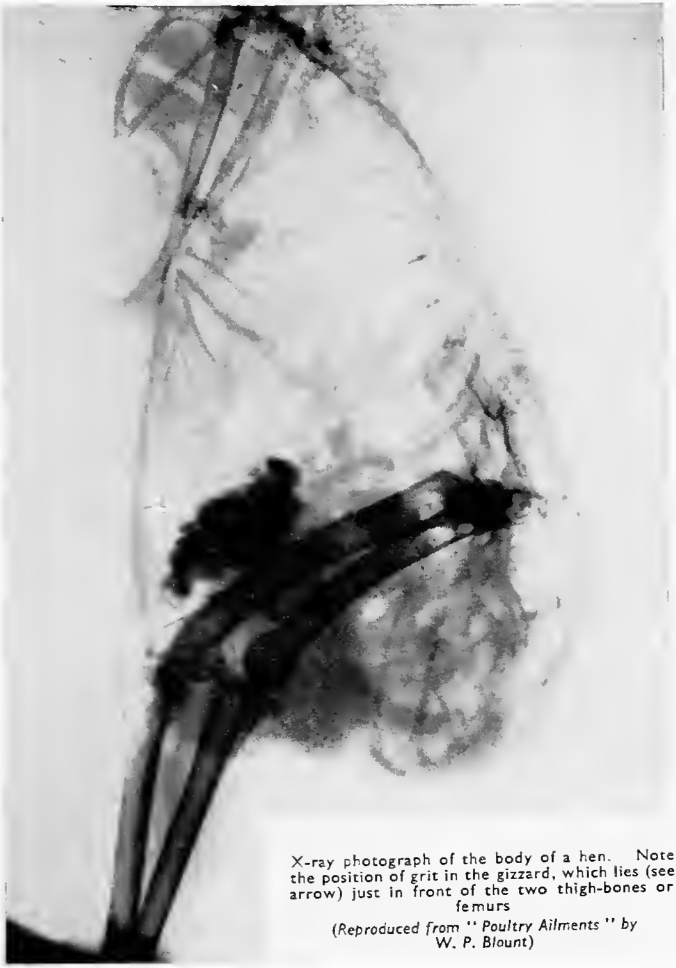
It would probably be safe to say that many troublesome outbreaks of disease on a farm are due to one of two things—failure to cull and failure to isolate. The importance of culling, making a start with eggs that enter the incubator or are put beneath a broody hen, and passing right through the growing, laying, moulting and breeding stages cannot be over-emphasised. A candidate for culling is a potential danger to every hen with which she comes in contact and until the poultry-keeper realises this the first lesson in disease control is lost to him.

Isolate Without Delay

Second lesson is the immediate isolation of any bird suspected to be sick. No matter how simple the ailment or how speedily it can be cured there is only one place for the victim—the isolation coop. Then, when her owner has satisfied himself regarding the trouble he must make up his mind quickly whether treatment is worth while or not. In the case of something that is contagious this often means that sacrifices have to be made, but those sacrifices are worth while if they result in allaying an outbreak of trouble which would fill all the isolation coops on the farm in as many minutes as there are coops.

It is not enough merely to determine the trouble and then to burn the carcase. A dead bird provides the poultry-man with raw material upon which he can work, she gives him the chance to study anatomy and physiology from the inside. And let it be recorded at once that he cannot conduct too many of these private post-mortems. Some of us have studied the anatomy of a fowl for more years that we are ready to confess, but not one of us, fools excepted, is a know-all!

It has already been recorded that nature has an antidote for most ills and each antidote must be man-administered so



X-ray photograph of the body of a hen. Note the position of grit in the gizzard, which lies (see arrow) just in front of the two thigh-bones or femurs

(Reproduced from "Poultry Ailments" by W. P. Blount)

long as fowls are kept under the conditions of intensivism. In her natural state a sick fowl would fall by the wayside, she would probably take herself to an out-of-the-way corner to die, somewhere, perhaps, where her diseased carcase would not constitute a danger. Under conditions of domestication things are, however, different. She is denied access to many of the things that nature has given to her, in plain words she is made or marred by the treatment she receives at the hands of man. Which fact has led up to nutrition.

Bracketed with a knowledge of the anatomy and physiology of a fowl must be her nutritional requirements. Blount states that a bird may be excessively fat, fat, normal, thin or emaciated. To which it would be safe to add that nutrition plays a major part. An exceedingly fat bird would be quite content to wallow in her obesity were it not for the fact that such a condition might result in her early demise. A thin or emaciated bird may be disposing of just as much food as her fat sister but she is a walking skeleton because disease is interfering with the normal digestive processes and she is failing to extract goodness from the food she is receiving.

Observation and Commonsense

It is not necessary to re-write the chapter on feeding. What is, however, necessary is to place emphasis on all that has been written there and to suggest that the poultry-man be not satisfied until he applies the scientific principles recommended to the management of his flocks.

Summing up this introduction to common ailments and diseases it is necessary to add that some are hereditary, others are contracted, but all are recognisable by the employment of observation and commonsense. Here, then, is a list of the more frequent ailments, their symptoms and cure (if any) :—

ANÆMIA. Pale comb and face, dull eyes. Cure—Plenty of fresh air, sunlight and green food, also a teaspoonful tincture of iron to three pints water.

APOPLEXY. Symptoms.—Lying with head on floor or turned back. Put the bird in a dark pen, and give half-teaspoonful Epsom salts in wineglass of warm water every other day.

BRONCHITIS. Symptoms.—Difficult breathing or wheezing. Keep in dry pen and give 10 drops ipecacuanha wine in teaspoonful glycerine four times daily.

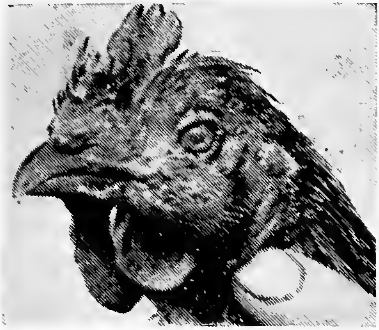
BUMBLE FOOT. Symptoms.—Swelling under foot or toes. Keep bird on a bed of soft hay and poultice the swelling, then lance and take out the matter. Dress with boracic ointment and bind up. A pinch of sulphur daily in soft food.

B.W.D. (See White Diarrhœa.)

Canker (Fowl Pox). This disease is caused by a virus, is highly contagious and is probably better known as fowl pox. In typical outbreaks growths are seen either inside the mouth of the bird or on the face, comb and wattles. These mouth growths, or lesions to give them their correct name, are a yellowish colour and usually restrict themselves to the sides or underpart of the tongue or to the larynx. More than one expert refers to them as cheesy growths resembling a rolled oat.

When they are outside the mouth (on the face, comb or wattles) they are rounded straw-coloured sores which exude matter and quickly resemble scabs. They spread with remarkable speed and the eyes of the bird can quickly become affected.

Dependent upon the virulence of the virus fowl pox takes from four to ten days to develop. The disease is most prevalent during winter.



A typical case of fowl pox with growths at side of face and on the eye lid of the victim. Swelling is also apparent

Treatment is almost wholly restricted to vaccination, a pigeon pox virus being used. Immediately on observation of an outbreak all infected birds should be removed, the more advanced cases being destroyed and their carcases burnt. Birds in the early stages of the disease can have the small growths removed from tongue, comb, face or wattles and the affected parts painted either with iodine or a strong copper sulphate solution. Every bird in the flock should be vaccinated immediately.

Experiments carried out with a solution of copper sulphate to the drinking water (avoiding metal vessels) have been more than justified. A 1 in 10,000 solution has proved most efficacious.

Catarrh. Nasal colds are extremely common in poultry, particularly at those periods of the year when one would least expect them, namely in summer and early autumn.

They should be handled with promptitude and the ailing birds isolated during the process.

Symptoms are watery nostrils which, literally speaking, are chock full of mucus. Unless the nostrils are kept clear catarrhal colds will hang to poultry for months. Bathe the heads of affected birds in warm water containing a few drops of an internal disinfectant or lightly coloured with permanganate of potash. With that finished the next step is to dip a stiff feather in oil of eucalyptus and work gently in the nostrils. Repeat the treatment morning and night until the birds are thoroughly clear of colds.

CHOLERA.—Symptoms.—Moping with wings partly outstretched, ruffled plumage. Greenish watery diarrhœa, frothy towards the end. Isolate ailing birds in a dry shed and give chlorodyne, three to six drops every four hours. All drinking water should be boiled, and slightly coloured with permanganate of potash. The runs will need disinfection, and houses should be thoroughly creosoted.

Remains a Disease Carrier

Outbreaks of fowl cholera are, fortunately, very few. One of its greatest drawbacks is that a bird can survive an attack and remain a carrier of the disease thereafter. In addition to the symptoms outlined above other signs of cholera infection are swollen wattles, abcesses and even those symptoms that are characteristic of roup.

COCCIDIOSIS. This is a disease produced by a parasitic organism transmitted from diseased birds by contaminated food, water or soil. The symptoms of the disease are that the caecal appendages become blocked with a greenish-yellow mass, also shown by nodules in the liver. Usually the symptoms are diarrhœa, loss of weight and blood in the droppings.

As, however, there is more than one type of coccidiosis some further explanation is necessary. The cæcal type attacks chicks at any age from ten to fourteen days upwards. The chicks present a lifeless appearance and stand about in corners of brooder house or run with drooping wings and ruffled plumage. Flesh disappears rapidly and the chicks are often so weak that they topple over on their sides.

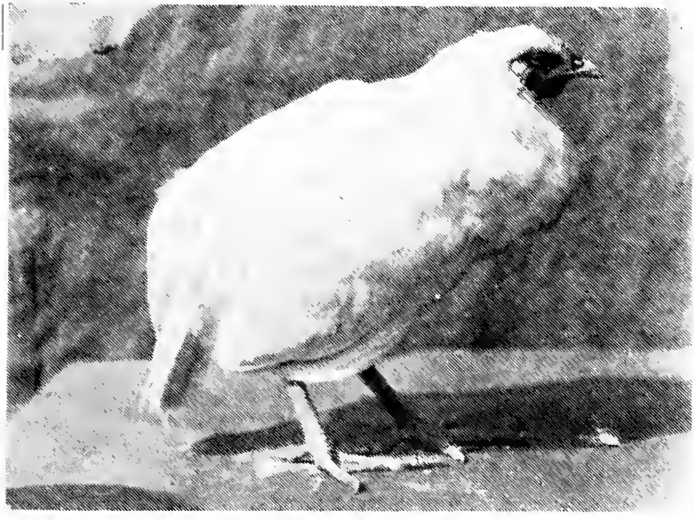
Post-mortem examination reveals a swollen and purple-coloured blind gut full of clotted blood. This could, quite correctly, be classed as hæmorrhage of the gut.

Several remedies, some partially successful and others a waste of time, have been applied. Among those giving reasonable results are medicinal hydrochloric acid, one teaspoonful to a quart of water, and iodine in conjunction with casein.

Duodenal coccidiosis attacks adult stock. It derives its name from the fact that the parasites infest the small intestines—the duodenum. Symptoms are, again, rapid wasting away of flesh and often the victims exhibit signs of paralysis. The birds lose appetite, hunch up their backs and sit about in corners of house or run paying no attention to the happenings around them.

No satisfactory treatment for duodenal coccidiosis has been found although remedies similar to those for the cæcal type are frequently recommended. Most important factor in the control of the disease is preventing contact through the droppings—wire floors for suspected flocks are an absolute necessity.

CONSUMPTION. Symptoms.—The comb may either be very pale or brilliant red, but the bird wasted to a skeleton. Not advisable to try to cure. Kill and burn the carcase and watch closely the remainder of the birds. If possible give a complete change of ground.



Here is a typical case of tuberculosis in a young pullet. Emaciated and with very little interest in the happenings around her she is a danger to the other birds with which she comes in contact. There are no cures for T.B.

Despite all the things that have been said to the contrary, consumption seldom manifests itself among young stock; favourite age appears to be following the first adult moult. The disease is, of course, contagious and, as already indicated, only a complete change of ground and a thorough disinfection of the houses and appliances will keep it in check. All birds that exhibit a rapid wastage of flesh should be killed and their carcases burned.

CRAMP IN CHICKENS. Toes closed together, walking on knuckles. Add a teaspoonful of salicylate soda to each pint warm drinking water, and give when cool. Give plenty of green food, not much meat, and allow the chicks to hobble on the earth. Cod-liver oil, at a rate not exceeding 2 per cent., should be thoroughly mixed in the mash fed to the chicks. Use small quantities of lime-stone flour in the soft food.

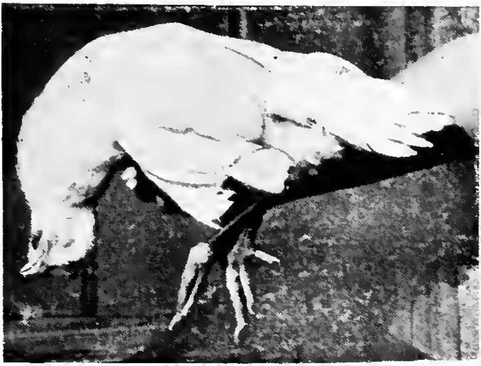
Emptying a Bound Crop

CROP BINDING. Symptoms.—Hard mass in the crop which does not move. Hold the bird under the left arm with head grasped in left hand and neck straight. Pour in $\frac{1}{8}$ pint of water coloured bright pink with permanganate of potash and knead the crop with finger-tips of right hand. As the crop softens turn the head down, open the beak and, with the right hand, gently squeeze the crop to evacuate the contents.

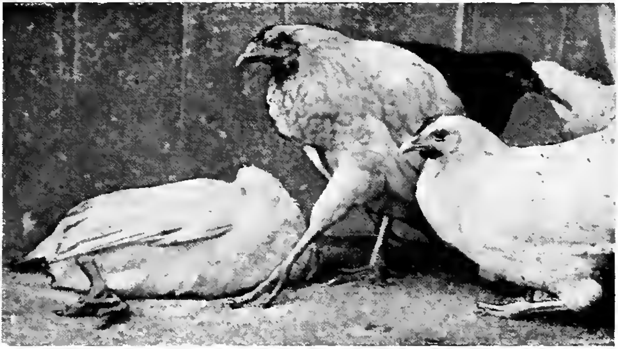
Repeat the process until the crop is empty, it is better not to try to get too much out at once. Add 15 drops tincture of iron to half a pint of drinking water, and keep the bird on a sanded floor and feed on bread and sour milk. Tough grass can only be moved by an operation.

Lay the bird on a bench with attendant holding it, the head to operator's left hand, wet the feathers and extract some where the incision is to be made, choosing a place where there are no large veins. Bathe the part with carbolic acid, one in twenty, and through the outer skin in a line with the neck (not across) make a $1\frac{1}{4}$ inch orifice in the crop proper, and carefully remove the obstruction with a spoon handle. When empty pour in and out again boracic acid lotion, close up both slits with a few separate stitches of catgut or horsehair and smear the part with cabolised vaseline.

DIPHTHERIA. Diphtheria or Diphtheritic roup is a very contagious disease in poultry. The symptoms are whitish or yellowish growths in the mouth, under the tongue and in the entrance to the windpipe, or in the nasal cavity and angle of the beak. The whole of the mouth should be washed out

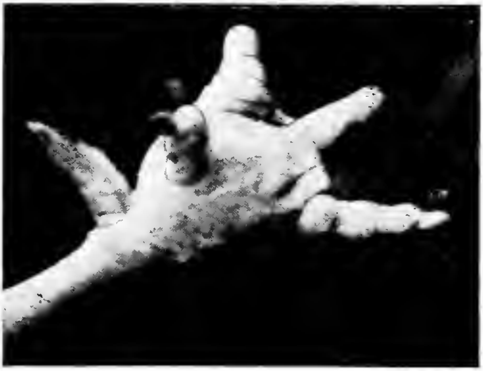


This bird, and those in the photograph immediately below, show varying forms of fowl paralysis. At first examination wry-neck was suspected in the bird on the left but the paralised toes of the left leg helped in the final decision.



A group of birds suffering from various types of Fowl Paralysis. Note the distorting effect upon the feet

Here is a really bad case of bumblefoot in an old male bird (note the spur). Treatment for this trouble, which is due either to hard stony runs or high perches in a poorly littered house, is detailed on page 120



twice a day with a good disinfectant, of which there are many. The mouth should be well swabbed with this or the whole of the head dipped in the solution until the bird opens its mouth. Sulphur at the rate of 1 teaspoonful between three birds can be given daily in the soft food. In the treatment of a flock 1 teaspoonful of any of the proprietary internal disinfectants can be allowed to every gallon of water used in mixing the wet mash. All ailing specimens should be isolated, and if it is restricted to a few it is really hetter to kill them off rather than keep them about the place to be a menace to the other birds.

The small growths in the mouth should be removed with a fine hairpin or wire loop and the spots dressed with iodine. Use also one of the proprietary roup cures.

DROPSY OF WATTLES. See Wattles.

DYSENTERY (*i.e.*, passing blood) is frequently endemic and is often coccidiosis. Give affected chickens powdered charcoal in soft food, a teaspoonful for each twelve under a month old and pro rata. Leave off grain for the time except chopped groats. Give a little olive oil in the soft food and barley water to drink.

EGG BINDING. Frequenting the nest with mopish appearance. Pass an oiled finger in the vent to loosen the rim of flesh which retains the egg, keeping the egg in place by gentle pressure on the outside of the body. If the egg is not passed in half an hour put the bird in a basket by a fire, and try again in half an hour's time. Five drops of ergot may be given, and five the hour following, allowing four hours' rest before trying again to remove the egg. Warm oil may be injected into the vent. After safe removal, feed sparingly and add Epsom salts to the drinking water.

EGG EATING. The best cure is a special nest which allows the egg to fall through a hole in the bottom out of the bird's reach. Another plan is to turn the nest box to the wall, just allowing room for the bird to get in, and darken it by means of a board, etc.

EGGS, SOFT SHELLED. First look to the grit supply, but a likely cause is overfeeding, and such birds should be taken off the perch at night and kept separately until after other birds have had breakfast, feeding the affected bird on hard grain and plenty of green food; add a teaspoonful Epsom salts to each pint of drinking water once each week.

ENTERITIS. Symptoms.—Ruffled feathers, great thirst, yellowish diarrhœa. Isolate ill birds, and call in an expert.

The remedies advised for cholera are suitable, and a germicide added to the drinking water. Cleanse the runs with powdered quicklime, leave until rain has fallen, then dig in. But the only safe way is to remove to fresh quarters. The runs have, of course, to be left empty for some months after using quicklime.

FEATHER PLUCKING. Provide plenty of exercise and green food, and add a teaspoonful sulphate soda and half teaspoonful carb. potash to each pint of drinking water. Smear any bare patches with carbolised vaseline or the feathers surrounding the bare patches with Stockholm tar. See that the fowls are free from insects. A small amount of table salt may be added to the soft food. A dry mash hopper containing bran always available is most useful.

FROST BITE. Comb turns dark or skin peels away. Apply camphorated oil and keep bird out of wind or frost.

GAPES. Symptoms.—Opening of mouth and coughing constantly. Put birds in a lined basket and fill it with tobacco fumes or shake in gape powder to make the birds cough up the worms, taking care to burn the latter. Keep the coops dry and apply gape powder freely all about the place.

Another most useful remedy for gapes is 1 teaspoonful of powdered camphor in the soft food of every 50 chickens once a day, at the same time using powdered camphor or gape powder freely about the coops, and adding to the drinking water a level teaspoonful of sulphate of copper to each half gallon or 1 teaspoonful of salicylate of sodium to each quart.

Gapes is restricted to very young chicks. Older birds that stretch their necks in the air and gape are probably suffering from intestinal worms or bronchitis.

JOINT DISEASE. Softening and decaying bones. Incurable and origin not known. Kill and cremate such birds.

KIDNEY DISEASE. Usually in complication with liver disease, etc. Symptoms.—Thirst, emaciation, ruffled plumage, diarrhœa. Give boiled pearl barley to eat, and the barley water to drink. Feed on bread and milk and green food but no meat. Add two teaspoonfuls of the following to each half-pint of drinking water: Iodide Potassium 1 drachm, water 6 ozs.

LIVER DISEASE. Symptoms.—Dull purple comb, lack of appetite. Give teaspoonful Epsom salts dissolved in hot water, afterwards ten drops tincture rhubarb per bird each morning and quarter teaspoonful magnesia and charcoal to soft food. As soon as possible get a specialist's liver remedy. Feed on oatmeal porridge, lean meat, groats, vegetables (except cabbage), no grain. Allow exercise in shady run. Chronic liver disease (avian tuberculosis) shows in yellow face and sharp breastbone, all sufferers should be killed and the land disinfected.

LEG WEAKNESS (in adults and half grown stock). Symptoms.—Crouching on the hocks. Half teaspoonful of Fellowe's Syrup in a little water thrice daily should be given and plenty of meat and good food. Cod-liver oil at the rate of 1½ per cent. in the soft food.

LEG WEAKNESS IN YOUNG CHICKENS. Chickens restricted too long indoors in the early parts of the year show a disposition to walk on their hocks with the toes doubled under. This form of leg-weakness—which may be of rheumatic origin —is due to inflammation of the veins of the legs. The legs should not be rubbed, but a level teaspoonful of salicylate of sodium should be added to each half-pint of drinking water, and 1 teaspoonful of cod-liver oil between every 12 chickens added to the soft food once a day. The outside of the shanks should be painted with iodine, or a little iodex carefully applied. Give more green food and allow the birds out on the bare earth whenever possible.

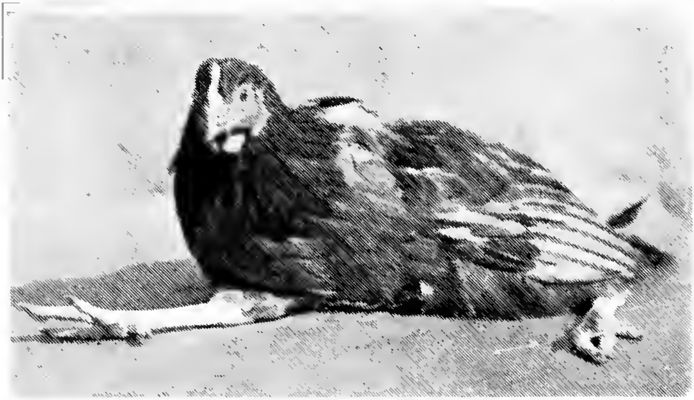
Scientific "Headaches"

PARALYSIS (Lymphomatosis). Little is known of this disease excepting that in a great percentage of cases it is accompanied by internal tumours. Paralysis is not always restricted to loss of use of the legs—wings and neck are affected in many cases.

This disease has probably caused more "headaches" among our scientific investigators than any other that could be named and not for months but for years were they completely baffled by its incidence.

It was quickly discovered that paralysis was characterised by the presence of tumours, a fact which indicates that possibly a virus might be the primary cause. Bulk of the evidence so far gathered is that the primary causal factor is inherited but that development of the disease depends upon errors in management and particularly deficiencies in the diet.

Paralysis shows itself in more forms than one, more often as a failure of the nervous rather than the muscular system. A significant feature of a number of outbreaks has been loss of eye colour particularly as it effects the iris. Normally the iris contains bright orange or golden tints, in paralysis it takes on a sombre colour while the pupil of the eye loses not only its regular shape but considerably decreases in size.



One leg stretched forward with the other to the rear are the typical signs of paralysis in this Rhode pullet. Note also that the wing is half open and comparatively useless. Investigation into the cause of this disease is proceeding

Pending more definite findings the only measures that can be taken to control the disease include a much stricter check on breeding and the total elimination from all breeding stocks of birds showing the typical eye defects outlined above.

Evidence that the disease is contagious is lacking, neither is it correct to imagine that ground upon which paralytic birds have been run is infected.

Pip.—A dry, horny tongue caused by stomach trouble. Give half teaspoonful of flowers of sulphur each morning in soft food. A teaspoonful of Epsom salts and one of carbonate of soda to each pint of drinking water. Dress the tongue frequently with glycerine and borax.

Pneumonia. Difficult breathing, cough and thirst. Keep the bird in a warm place and give five drops ipecacuanha wine every two hours in a little water. Warm bread and milk to drink. In young chickens it is hopeless, as these remedies cannot be employed.

In addition to this treatment for adults the bare patch under the wings—which is over the lungs—should be painted with tincture of iodine.

Quill Binding. Retention of web of feather in sheath. Linseed, boiled to a jelly, and added to the soft food at the rate of a dessertspoonful for every six birds is an excellent remedy. Give cod-liver oil and extra fat.

ROUP. Symptoms.—Bad smelling discharge from nostrils, swollen face. Isolate ailing birds, bathe swelling with hot vinegar and water and administer a good roup powder. For a flock give pulverised sulphate of copper, half teaspoonful to half a gallon of soft drinking water in earthenware vessels, or creosote pill (one minim) should be given twice or thrice daily.

SCALY LEG. Symptoms.—Raised scales or incrustations on legs. Isolate ailing cases, and paint the legs with paraffin up to the hocks, after a day or two wash with hot water and soft soap. Try to remove incrustations without making shanks bleed, and apply, in mild cases, carbolised vaseline, in severe cases, vaseline and creosote. Two weeks' treatment may be needed. Be very careful not to let paraffin touch the fleshy part of the leg.

T.B. and Vent Gleet

TUBERCULOSIS. Such ailing birds are unfit for table and are better killed and burned. (See also Consumption and Liver Disease.)

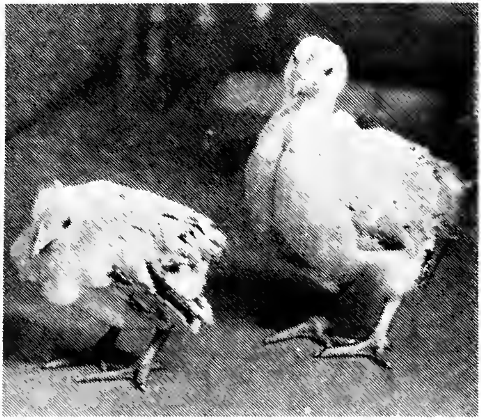
VENT GLEET. Symptoms.—Redness and incrustation at the vent accompanied by bad smelling. Isolate ailing birds and give teaspoonful Epsom salts every other morning. Soak off incrustation with hot water and carbolic soap and dress with zinc ointment. Give sulphur in the soft food. The attendant should be particular to cleanse his hands after handling the birds.

VERTIGO. Running in a circle. Treat as for apoplexy.

WATTLES, DROPSY OF. Usually a phase of roup. Hard swollen wattles. Bathe in hot vinegar for some days, and if the swelling does not diminish, lance wattle at lowest part and get out any fluid. Syringe the wound with weak solution of perchloride of iron. Give half a teaspoonful of sulphur in soft food, daily.

WHITE COMB. Symptoms.—White scales on comb, which turn into cup-like crusts, spreading over body and causing loss of feathers. Bathe comb and affected parts with hot vinegar and water and apply carbolised vaseline, ten per cent. It needs persistent attention, and the attendant must not touch his face while doctoring such birds. In severe cases expert advice should be called in.

WHITE DIARRHŒA (highly contagious). This is chiefly restricted to young chicks and often produces very serious mortality. The chicks lose weight, show a peculiar long head, walk with the wings drooping and projecting from the body, and they have difficulty in standing together with a characteristic white discharge. Brooders or coops, or anything that has been in contact with them should be most thoroughly disinfected. Medical treatment is of very little value, but ¼ oz. of sulphocarbolate of zinc may be added to each quart of drinking water. B.W.D. is hereditary and is a disease of the ovary. It is controlled by blood-testing the breeding birds, carriers of the disease being eliminated from the breeding pens.



These two chicks are of the same age. The normally grown bird on the right has, however, had something that the other has missed. It is a regular dosage of cod-liver oil. Acclaimed as one of the greatest scientific discoveries for poultry in the twentieth century c.l.o. is now universally used in all chick-rearing mashes

Worms. Symptoms.—Loss of condition, ravenous appetite, etc. The birds should go supperless to bed and next morning have ten drops of turpentine in a little olive oil. A couple of hours after give a warm mash of scalded bran containing a teaspoonful Epsom salts and quarter teaspoonful table salt. The rest of the day feed as usual. Repeat treatment every other day until cured, allowing half dose to half-grown chicks. Drinking water should be boiled and all used litter burnt. If possible move birds to fresh land.

Further remedies are 5 grain doses of Areca nut given to each bird of about 4 lbs. weight, or 2 grains of Santonin.

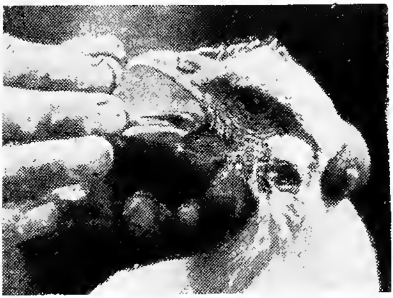
It is of little use driving the worms out of a bird and then leaving them on the droppings board to be devoured.

NOTE.—The doses are for birds 4 to 5 lbs. weight; other birds should have larger or smaller doses pro rata.

Poultry Parasites

On a well regulated farm there should be no parasites, but it is essential for the poultry keeper to know them so that he may be on his guard when purchasing fresh stock, as parasites spread with rapidity. Some parasites are comparatively harmless, others are destructive.

THE RED MITE (*Avaindermanysus*). Small dark red, scarcely larger than a pin point, rarely found on birds during the day, but come forth at night from crevices in the house and beneath perches, where they may be found in clusters. Outside the holes where they hide may be seen silvery grey powder, the skin young larvæ have sloughed. These mites suck the blood of their victims and a great number can cause the death of a well grown fowl. Paleness of face or comb is sometimes an indication of their presence.



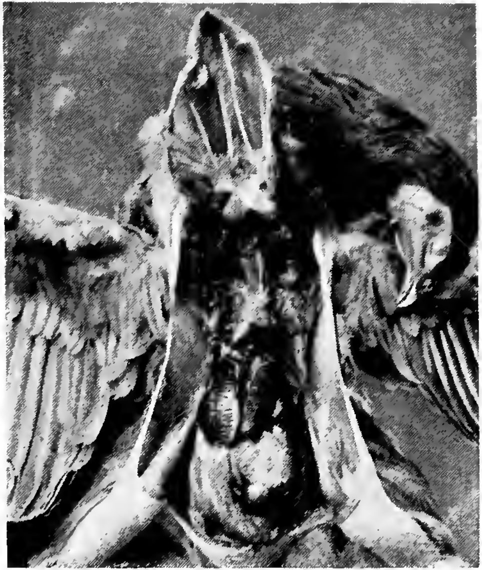
Correct method of giving a pill or a worm capsule is to hook the forefinger of the left hand behind the head of the bird and to gently prise open the beak with the thumb of the same hand. Remaining fingers are cupped at the front of the neck. Right hand is left free.

House and perches should be kept scrupulously clean by scrubbing with soft soap and water, and painting with a strong insecticide once a fortnight. Limewash alone will not kill or harm the insects.

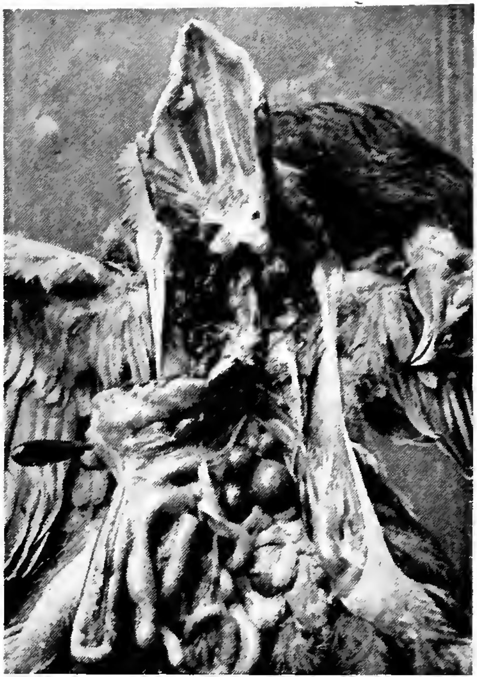
An alternative plan is to use nicotine sulphate on the underparts of the perches and in the sockets in which they rest.

THE HEN FLEA (*Pulex Avain*). The hen flea begins in the maggot stage, and is found entirely in the nests and rarely on the birds. The presence of such is a sign that the sanitary condition of the house is not attended to, and one may see pupa maggots and unhatched nits lying amongst sand and down in dirty nests.

The fully grown flea may be a quarter of an inch in



This is the first stage in the examination of a dead bird. Breast bone has been removed to reveal all the internal organs in position. The intestines are not exposed to view, but the liver and gizzard are clearly seen



Gizzard and liver have been removed to reveal intestines and a flourishing ovary length. Dalmatian insect powder is the best remedy, and the nests should be kept clean and scrubbed with hot water and soft soap periodically.

MENOPON PALLIDUM. Called the red louse: an orange coloured parasite which eats the feathers, also causing much irritation. It is this species which gets on the hands when plucking a fowl affected with them. These lice rarely live 24 hours away from a fowl, and does not attack ducks.

CONICOTES HOLOGASTER. Sometimes mistaken for Menopon, but larger in abdomen, and having brown bands.

LIPERURUS VARIABILIS. A narrow species found occasionally among the barbs of wing feathers. It is long and pale in colour.

FOWL TICK (*Goniodes Eynsfordii*). This restricts its attention to the head of chickens. It should be sought for at the base of the fluff on the head, its head buried in the flesh, the body turning over in the air with the head down. White precipitate is safe as a remedy if used sparingly, or carbolised vaseline or carbolised oil, which must not be allowed to go too near the eyelids.

When Feathers Disappear

DEPLUMING PARASITES (*Scabies Lœvis*). When fowls pluck feathers out of each other, the presence of this mite may be suspected. These parasites cause a great loss of feathers, and loss of rest. Poisonous remedies such as mercurial ointment should be avoided. A little plain boracic ointment may be used.

Where no other remedy is mentioned, insect powder should be used. All remedies should be applied weekly for three weeks, in order to destroy any nits or eggs that may hatch during that time.

CHAPTER XIII

TRUSSING TABLE POULTRY

IN private trade it is very necessary to be able to truss poultry attractively, a nicely trussed fowl commands more money than one trussed indifferently. Fowls sent to the market are always rough-plucked only, not trussed.

In trussing for roasting (with string) take the plucked and singed fowl, lay breast downwards on the table, pinch up the skin and cut a slit across the back of the neck, making the cut towards the head, this is to leave a flap to cover over the neck when it has been taken off. With the poultry knife make a deep slit up the outside of the shanks to expose the sinew. Pass the point of the steel or stout skewer under the sinew and out again on the shank, this will lift the sinew above the shank. Now twist the skewer round, and, having got a good grip, pull down from the hock and the sinew will leave its attachment high up in the leg and come clean out.

With the point of the knife cut off the neck close to the shoulder, withdraw the stump. Cut off the head, leaving enough skin to reach to shoulders or the middle of the bird's back, now pull away the bird's crop, twist it round the finger, and pull well to loosen the internal organs. Pass the forefinger into the body and feel for the lungs, which lie embedded in the back, scoop these loose, but do not withdraw them. Next run the forefinger right round from the back (inside) round the breast, and loosen all strings or attachments that come in the way until the finger has completed the circle.

Turn the fowl on its back, and cut across between the vent and tail-piece, insert the two fore-fingers and loosen the intestines, which hook out without breaking (don't detach), this leaves more room for the fingers to be inserted higher up to hook round the gizzard and, if possible, the liver and heart. Next withdraw the gizzard, which should come away with the heart and lungs attached. Now cut off the intestines at the vent, cutting out the vent too.

Properly done the bird requires no washing, but if the intestines should break, wipe out with a cold, wet cloth.

Now take a long 8 to 10-inch trussing needle (an ordinary packing needle is a good substitute) and some clean, white string. The bird should be placed on its back and the thighs pressed down level with the table, pass the needle through the fold of the legs, right through the body, and out between the fold of the legs on the opposite side. Then turn the bird on its breast, spread out the wings, then close them up to the body, the small end-piece of the wing will then be pulled up and across the neck and shoulders, where it clips and keeps its position.

We now pass the needle between the bones of the second joint of the wing from the outside, as it comes through, the joint should be taken through the bones of the small end-piece which is folded back, the needle carried on to the next wing end, and through this and the second joint, just the reverse way to the last motion, as one is left and one right, and the needle should then come out through the second joint of the wing, and near to where the needle was first inserted in the body. The two ends of the twine are then tightly tied together.

Through the Thigh Bones

Needle and twine is then passed through the thigh bones (a natural hole will be found in these) from one side to the other and the ends of the string tied tightly over the thighs, just below the hocks. Cut off the legs and the bird is trussed.

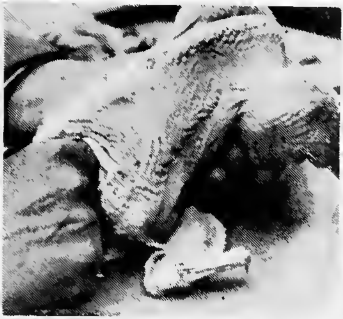
Liver and gizzard should then be placed in the fowl.

For the skewer method prepare as before up to the point of using the needle. Then take the bird, place hocks on table and force thighs back until they are well above the back, pass the skewer through the two bones of wing near the elbow, then right through the fold of the leg and thigh and across the back, at the same time looping it through the neck flap which it secures in position, and on through the other leg and angle-joint of the wing.

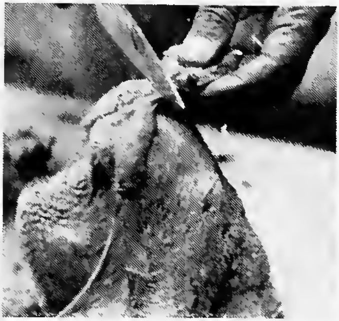
Make a slit in the web of the wing and pass through half the liver and half the gizzard, one under each wing, and fold the wing end back over the neck as before, thus securing the liver, etc., in position.

Take the twine and needle, pass the needle through the flesh below the end of the breast bone. Detach the needle and take the loose ends and tie tightly over the thighs near the hocks. Now take the loose ends of the twine and tie very tightly round the tail-piece, finishing off with a bow that can be easily undone by the cook for stuffing the fowl.

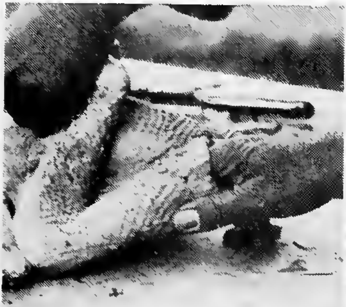
The other method is to take a skewer, and pass under the muscle above the hock, on the under side, and pass right through the pelvic bones, out the other side and through the



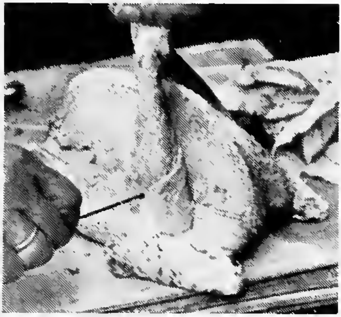
Pull away the crop of the bird. Twist it between the fingers and pull well to loosen the internal organs



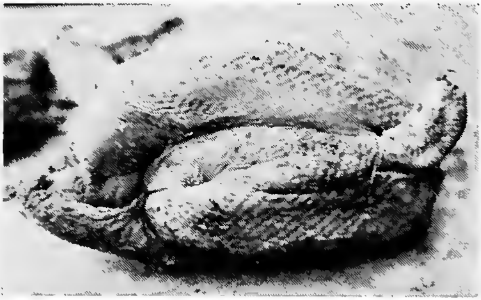
Cut across the vent and tailpiece to help in the insertion of fingers for the withdrawal of the intestines



Loosen the intestines. Hook fingers round gizzard, liver and heart, and gently withdraw the whole of the internals



Needle and twine is passed through the thighs from one side to the other and the string tied tightly close to the hocks



And here is the bird finished ready for the oven except for the stuffing. This is filled in at the crop end and the small piece of loose skin remaining there serves as a flap. It can be skewered or stitched in position other leg just above the hock. The hole left by cutting out the vent is now pulled over the tail-piece and the bird is ready for sale.

Turkeys are trussed in the same way as fowls, either method.

In preparing ducks and geese for trussing the same mode of procedure should be adopted as for fowls, except that as a rule the sinews are not drawn.

Assuming that the carcase is devoid of its internals, we take the duck and cut off its wings at the first joint from the body. Take the feet and cut off the back toes, now nick round the pad of the foot, and the skin round the outside of the toes, take a firm grip of the pad, between the blade of the knife (inserted under it) and the thumb, and pull off the whole of the sole of the foot, leaving the stripped toes and web.

Finishing Touches

Lay the duck breast downwards, legs spread out on each side of the tail, and, keeping the hock close to the table, bend the foot the natural way under the thigh, but keep the hock level with the table. With the finger and thumb between the thigh and tail-piece lift the foot through and spread the under side of the foot over the back.

When both legs are done, thread a string through the hocks and pull up close to the body, tying the string and passing over the back. The vent having been trimmed round, and the neck, liver and gizzard placed inside the duck, pass the vent over the tail-piece. The loose wing stumps may be skewered to the sides of the bird with short skewers.

Another method is to skewer the thighs behind the back as in case of a chicken, then fold the feet behind the back as described.

Geese should be treated the same way. Christmas geese often have the wings strongly secured by a piece of tape or ribbon ½ inch to an inch wide, right round the body, this makes an effective finish.

CHAPTER XIV

INSIDE THE EGG

THE egg occupies too important a place in commerce to need justification in the way of figures shewing exports or returns, although the uninitiated public have not the slightest notion of a tithe of the various uses to which the egg is put, in fact to outline all its uses would be quite beyond the province of a work like this.

Apart from its use in the dietaries of the country it is greatly used in the manufactures of the world, calico printers use it, and saddlers. The chemist is dependent on it for emulsions and hair restorers, etc., and in the compilation of a cookery book what could take the place of the egg?

Colour of eggs laid by various breeds may be roughly classed as brown, white and tinted, that is tints mid-way between white and brown. Duck eggs vary in colour from the duck egg green to pearly white, and turkey eggs are usually cream colour with dark coloured spots. Goose eggs are large and white. One domestic breed of fowl, the Araucuna (a native of South America), produces a pale blue egg.

Opaque Membrane

The shell of the egg is composed of phosphate and carbonate of lime in conjunction with a little glutenous matter, and in the top of the egg on peeling off the shell the first opaque membrane known as the shell membrane is exposed to view, and on opening this with a needle there will be seen between it and another layer of membrane, the small aperture known as the air cell, which gradually increases in size as the egg increases in age. As a guide it may be said that the cell in a new-laid egg may be covered by a three-penny piece, while in a three weeks' old egg it will scarcely be covered by a florin.

The yolk will be noticed floating in what is termed the white, and, if the egg has been carefully broken into a saucer, three whites will be visible instead of one watery white. In a good egg these three whites will be clearly and easily distinguishable, as they represent an egg full of rich quality of albumen, the purest form of albumen possible to obtain.

The thick, whitish strings adhering to the side of the egg are dense albumen known as the chalazae, the Greek name for hailstone, owing to their likeness to the hailstone, and they keep the yolk suspended in the albumen and always keep the small germinal spot uppermost.

This spot will be noticed on the upper side of the yolk. It is kept in this position because it is more likely to receive the heat from the breast of the sitting hen. If an egg is poured from cup to cup in a careful manner it will be seen that this spot always comes to the top if there is room for it to turn properly.

The yolk is enclosed in a thin transparent membrane known as the vitelline membrane, and on top of this is the semi-opaque disk, which is the blastoderm or germ cell before referred to as a spot; from this point the embryo begins to grow. This is situated over a portion of the yolk known as the white yolk or utricle which descends to the centre of the yolk, and if a hard boiled egg is cut through, three white yolks and three yellow yolks will be discernible and can be pulled off in rotation.

Spots of Blood

Poultry keepers are often perplexed by finding spots of blood in new laid eggs. They are caused by the rupture of a small blood vessel. If they continue to appear the offending bird should be cooped alone and fed on a limited quantity of grain. If she cannot be found a small flock could be treated by adding 20 drops of tincture of perchloride of iron to each pint of drinking water. As a rule the trouble ceases without treatment.

Ordinary hen eggs take 21 days to hatch, ducks and turkeys 28 days and geese 30 days.

Standards for judging eggs are not nearly so widely known as they should be. In America and on the European continent, close standards are drawn up and rigidly adhered to. The Poultry Club of Great Britain has, however, left this work to societies catering more for the utility side and, consequently, it has been neglected. At the time this book is going to press, the Club is altering this unfortunate state of affairs and full standards for eggs will appear in the revised edition of Poultry Club Standards.

CHAPTER XV

BY-PRODUCTS AND SIDELINES

POULTRY farmers look at the question of by-products from different standpoints. To some, these things appear worthy of consideration, to others the loss of time in accumulating them would cause an actual loss in the realisation; still the fact remains that in poultry manures the agriculturalist has some of the finest dressings for his land that can possibly be produced, and the value of them is becoming more known to farmers every year. Look at it from two standpoints, one is that it emphasises the desirability of having the manure removed from the farm, the other is that it has commercial value.

It has been reported on excellent authority that it is a more concentrated and better dressing than the ordinary form of manure, but for whatever purpose it is intended, dry storage is very essential. It is an exceedingly wasteful proceeding to throw it into the ordinary midden for the rain to wash its most valuable constituents into the soil beneath, and on an up-to-date farm, a large dry shed should be provided for the storage of it, into which shed it should be removed periodically from the house.

One Acre—Half Ton

The poultry keeper when offering it for sale might remember that as a rule half a ton of dry, well-broken poultry manure is sufficient dressing for an acre of land, and the smaller lumps it is broken into the more efficacious it will be.

The composition of fresh poultry manure is:—

Water	60.0	Dried—	
Organic Matter ...	19.2	Organic Matter ...	59.26
Ammonia	1.75	Phosphates	12.79
Phosphates	4.3	Carbonate of Lime	23.58
Salts (Alkaline) ...	1.10	Alkaline Salts ...	3.37
Carbonate of Lime ...	8.1		

Feathers have two outlets. One is to feather merchants for various commericial purposes, the other is to be used as manure, though perhaps the amount needed for this is not very great. In selling feathers for commercial purposes, price varies according to condition and colour.

When plucking poultry, the feathers should be sorted for colour and size. If possible, white, black and brown should be kept separate, the whites are more valuable than the others. Duck and goose feathers should also be kept separate as they are worth far more than hen feathers. On no account should the stiff wing feathers be mixed with the soft ones, as this immediately reduces their value considerably.

Feathers can be stored or prepared for use for private customers by being placed in paper bags, tied up and baked in the oven at intervals of half an hour repeated on different days, after which the bags can be slung to the roof of a dry kitchen ceiling or some other warm dry place.

When used for the purpose of manure, they realize a higher price than poultry manure, and are valuable in the cultivation of hops. The advisability of keeping the stiff feathers away from the small down feathers is evident, as the long feathers are rather slow in decomposing; this the agriculturalist is aware of, but the small down feathers form a very active manure and consequently realise slightly higher prices. Feathers may be classed as nitrogenous manure, containing about 90 per cent. of nitrogen.

Eggs for Hatching—Day-old Chicks

Perhaps one of the most universally adopted sidelines on the farm, incidentally it is one that calls for a fair amount of pedigree work and special labour, is in the sale of hatching eggs and day-old chicks.

The business in day-old chicks is not likely to be overdone, and most poultry farmers can make something extra with their eggs, just when egg prices are at their lowest, by turning them into newly-hatched chickens. The greatest asset to this branch of the business is having the eggs to incubate laid on the farms, as fresh, untravelled eggs hatch freely.

At no time in a fowl's life does it travel as well as during the first 24 to 48 hours of its existence. The reason is that the newly born chick requires neither food nor water during the first 48 hours of life, and can go even longer. Owing to this natural advantage the chicks can safely travel 300 miles or so on rail or water. The physiological reason being that the chick absorbs the yolk just prior to emerging from the shell, and this supplies all the pabulum required for the time stated.

During the time the chick absorbs this, it becomes stronger and stronger, arriving at its journey's end ready to jump out of the box and begin feeding almost at once.

Specially made boxes are made for the conveyance of newly hatched chickens, and are to be advised, as they give a much more business-like aspect to the consignment, and greater satisfaction to the customer. A stock size for a dozen chicks is a box 9 inches by 14 inches by 9 inches in height or thereabouts. For a couple of dozen a box 15 inches square is used. It is better to send two or three boxes with a couple of dozen in each than to pack all the chicks in one consignment.

Long light boxes with divisions in are used to take as many as the box will hold in dozen lots in each separate compartment. These boxes are made of light wood and/or cardboard, and are fitted with the requisite ventilation holes.

If any other light box is used, it might be flannel lined, tacking some soft hay between the flannel and the sides of the box, and rounding the corners so that the nest is circular, this is very advisable as chicks tend to crowd in any corners and so suffocate one another.

They Travel Best at Night

As a rule night is the best time to dispatch chicks, choosing the through mail trains when sending a long distance. A good railway guide, and the patience to study it, is a most useful adjunct to this business. It is a good plan to send printed instructions as to how the chicks should be treated on arrival; warmth is more than food to them at such times, when well warmed up they will eat.

The seller is by custom supposed to replace those that die on rail, therefore the package should be examined by the buyer, and before signing for them at the station, the railway officials will be able to verify the number dead, in case of doubt or dispute, as the consignee will sign the sheet for number of dead, if there be any. Be prompt in despatching punctually. Don't take more orders than can be fulfilled, rather the other way, since a waiting customer rarely comes a second time.

Do not substitute one breed for another and say it will do as well; if you cannot fulfil the order, return the money promptly. Don't forget to advise the purchaser by the mail preceding the dispatch of the chicks. Chicks cannot be sent by Parcel Post.

The chicks should be dispatched as soon as dry, or nearly dry, from the incubator, and no attempt should be made to feed them.

Sittings of eggs are more conveniently packed in specially made boxes either of cardboard or wood in which, as a rule, they carry very safely. The other method is to procure a light box, line it with hay, and roll each egg in a square of paper, then twist round it a wisp of hay, and place them side by side in the box to within an inch or so of the sides.

Fill in every niche with hay and between each layer of eggs use a sheet of stiff paper and a layer of hay and proceed with the next layer of eggs until the box is almost full, completing it with a thickness of hay on top. Then screw or cord the lid, but do not use nails.

Eggs for hatching are sold in lots of one dozen upwards and the usual proceedure is to replace infertiles once only. At testing time the eggs that are infertile are returned to the supplier and, after examining them, he replaces.

Fifteen and No Replacements

A much better plan when small lots are bought is to ask for 15 to the dozen with no replacements. Where, however, an agreement to replace infertiles is entered upon, the poultry-keeper must adhere to the proviso that all infertiles are returned to the vendors. Such eggs would not include any with broken yolks and, where rough handling on the rail has been experienced, there will be a fair percentage of these. While the post office authorities will accept egg parcels it is always better to send valuable hatching eggs by rail.

In packing eggs for market the " long hundred " is 120. In packing a box of eggs nothing but very clean materials should be used, as anything that has gone at all musty will impart a flavour to the eggs. For speed and facility the patent egg-carriers which are used on most progressive poultry farms, and are obtained at appliance makers, are best. (See also chapter on Appliances.)

GLOSSARY OF POULTRY TERMS

A.O.C.—Any other colour.

A.O.V.—Any other variety.

Abdomen.—That part of the bird beneath the vent and down to the "loose" end of the breast-bone.

Barred, Barring.—The stripes of dark and light across a feather.

Beard.—A bunch of feathers beneath the throat in certain breeds, such as Polish or Houdans.

Bean.—A black spot or mark, at tip of upper mandible in waterfowl.

Beetle Brows.—Heavy overhanging eyebrows, as in Malay.

Boning.—Taking out the bones of a fowl for table use.

Boots.—Feathers projecting from toes as in the Brahma, etc.

Brassy.—Yellow or yellowish feathers on the shoulders or hackle of cockerels.

Breast.—The front of the body from the point of the breast bone up to the throat, in a live fowl; in a dead table fowl the breast is each side of the breast bone.

Breed.—A certain kind of fowl having particular characteristics. The term breed includes the varieties of colour of that breed.

Bricky.—A dull harsh red colour, usually found on buff cockerels, and dark topped Black-Red Game cocks.

Brood.—The number of chicks under one hen or brooder.

Broody.—Having a tendency to sit or incubate, *i.e.*, to hatch.

Brows.—Overhanging eyebrows of a Malay fowl.

Cap.—Comb; also back of fowl's skull.

Cape.—The feathers between the shoulders under the base of the back or hackles.

Carriage.—The style or bearing of the bird.

Caruncles.—Protuberances of a fleshy kind, such as are found on the neck of a turkey cock.

Chain Armour.—Refers to lacing on a claret breast of Rouen drake; a fault.

Chick.—A newly hatched fowl, or one that is not more than a few weeks old.

Chicken.—This is a word indefinitely applied up to the age of twelve months old.

Claret.—The breast colour of a Rouen drake.

Clean-legged.—Having no feathers on the legs. (Opposite term to feather-legged.)

Cloudy.—See Mossy.

Cob.—The male swan.

Cobby.—Stoutly built and rounded in form.

Cockerel.—In show parlance, a bird that is hatched in the year it is exhibited. In utility language a young male until the first adult moult.

Collar.—A white ring round the neck of Rouen duck.

Comb.—The fleshy ornament on the head of a fowl. There are several kinds of comb—e.g., single, rose, pea, etc.

Comb-over.—Having the comb dropping over to one side as in Leghorns, Minorcas, or heavy rose combed birds, or when the comb does not sit squarely on the head.

Condition.—The state of a bird's health, or plumage, especially the latter.

Coop.—A small wooden structure accommodating hen and chickens or for keeping fowls to fatten, or for the suppression of broodiness.

Cradle combed.—A term applied to a Wyandotte comb which is sunken in the centre.

Crammer.—A machine for fattening poultry, or an individual who fattens poultry.

Crest.—A tuft of feathers on the head of a fowl such as in the Polish or Houdan.

Crop.—A pouch which is the receptacle for food before it passes on to the first stomach.

Cup Comb.—A peculiarly shaped comb as in the Sicilian Buttercup.

Cushion Comb.—Another quaintly shaped comb as in the Silkie.

Curves.—The sloped back and tail of a Malay and their relative angles.

Cushion.—The bulk of feathers from middle to end of a hen's back partly covering the tail.

Deaf Ears.—Ear lobes.

Dewlap.—The gullet of a goose. Seen to the best advantage in an adult bird.

Diamond.—A term applied to the wing-bay or wing-end.

Dished.—A lobe which dips in the centre like a saucer.

Dished Bill.—The down curves in the upper bills of some ducks.

Dominant.—A quality so strongly marked in a bird that it can be handed down to its progeny in almost equal strength.

Double-laced.—An inner ring or marking on feathers of Indian Game, also an outer edging of ground colour beyond the black lacing of Wyandottes.

Dubbing.—Clipping off the combs, wattles, etc., to leave the head smooth and clean.

Duck Foot.—The back toe being carried closely to the other toes instead of being spread out behind.

Ear lobes.—The folds of skin that hang behind the ears, red or white, according to the variety.

Face.—The skin behind the eye.

Feather Legged.—Having feathers at the sides of the shanks and feet; as in Brahmas.

Feather Tracts.—The distinct areas on a fowl's body on which the feathers grow.

Finely Drawn.—Applied to tall birds with fine bones, spare body, tight feathers and narrow sickles, light and sprightly.

Flat Shins.—Flat fronts on a Game fowl's shanks. This is a fault as they should be rounded.

Flights.—The primary feathers of the wing used in flying, but folded out of sight when not in use.

Fluff.—The downy part of the feathers, also the feathers on the belly to the rear of the thighs.

Frizzled.—Each feather curled backwards as in a lady's boa.

Furnished.—A cock when he has a full tail, hackles and comb, etc., is considered furnished.

Gay.—The high or "squirrel" tail, also the heavy white splashes on Anconas, Houdans, Exchequer Leghorns, Hamburghs and Spangled Game.

Gills.—The region of the throat and wattles.

Gipsy Face.—When the skin of the face is a natural dark purple colour or when it is covered with black hairs or small black feathers.

Green Bone.—Bone cut fresh from the carcase at the butcher's; the term implies freshness and has nothing to do with the colour.

Grey.—A mixture of black and white on the feathers, chiefly wing and tail, of what should be self-coloured varieties.

Hackles.—The narrow lance-shaped feathers on the necks of fowls and the saddles of cocks; *i.e.*, saddle hackle and neck hackle.

Hangers.—The shorter sickles like feathers at the base of the cock's tail; also termed tail coverts.

Hard-feathered.—Feathers having a hard glued down appearance, or a variety of fowls carrying very scanty fluff.

Heterozygote.—Diverse characteristics carried in the same individual or zygote.

Heavy Breeds.—The sitting varieties.

HEN-FEATHERED.—Like a hen in plumage or in having no sickle or hackle feathers.

HIGH IN BACK.—A deformity, sometimes known as roach back and indicating malformation of bone.

HOCK.—The joint between the thigh and the shank.

HORSE-SHOED.—The lacing of Wyandottes, which instead of encircling feathers falls short, giving a horse-shoe effect to the feather tip.

HOMOZYGOTE.—Two gametes with similar characters meet in zygote.

KEEL.—The loose flesh and feathers dependant from breast of ducks and some breeds of poultry.

KNOCK-KNEED.—Having the hocks near together; they ought to be well apart.

LACING.—The edging round the feather; generally a darker hue than the ground colour, as in Wyandottes.

LATE HATCHED.—Hatched out after May.

LEADER.—The single spike terminating rose combs; also "spike."

LEAF COMB.—Comb shape of butterfly with wings open, seen to advantage on Houdan cock.

LEG-FEATHERS.—Feathers attached to the outer side of the shank.

LIGHT BREEDS.—Varieties which do not sit. Mainly of the Mediterranean Class.

LIMBY.—The length of the thigh in the Malay.

MARKINGS.—Barring, lacing, etc.

MANDIBLES.—The upper and lower halves of the beak.

MAZARINE.—A term applied to the deep blue or purplish markings across a black feather.

MARBLED.—Applied to the ticked and laced feathers on the Pile Game cock's breast.

MEALY.—Feathers stippled with a lighter shade giving the appearance of having been dusted with flour.

MOONS.—Spangles.

MOSSY.—Confused, indistinct markings.

MOULT.—The autumnal change and casting of feathers.

MUFFLINGS OR MUFFINGS.—Side whiskers and beard on the heads of some French breeds.

NON-SITTER.—Varieties which do not incubate their eggs.

PEA-COMB.—A triple comb, like three small combs side by side, or in one, the middle one being the highest.

Ped.—A specially-made light crate for packing dead poultry for market. Typical of the Heathfield district.

Pen.—The female swan.

Pen.—A run in which a number of birds are kept in strict confinement; a show cage.

Pencilling.—Small stripes across the feather, either straight or crescent-shaped; also refers to a grey marking of a Rouen duck and black spots on the plumage of Black Red Game hen.

Pencilly.—Having thin pencil-like spikes on the comb.

Pencilled Spikes.—Spikes of single comb very long and narrow nearly as broad at base as top. A defect that would penalise a bird in the show pen.

Peppered.—Having small black spots on the feathers inside the lacing of a feather or on the ground colour of a plain colour variety, as black dots on buff flight or tail of buff breeds.

Petit Poussin.—French term for a milk chicken, sold at the age of six to eight weeks. Weight 12 to 16 ounces.

Poult.—A young turkey.

Poultry.—Fowls, ducks, geese, turkeys, guinea fowls and bantams.

Primaries.—The first ten feathers in a fowl's wings, *i.e.*, those farthest from the body.

Purply.—With purple bars across greenish-black feathers.

Pullet.—In show terms a bird hatched in the year exhibited; in utility terms a female until the first moult, after which it is called a hen.

Quill-bound.—Retention of the web of a feather in its sheath (which should crack and fall off).

Reachy.—Term applied to height in varieties where tallness is a virtue; length of neck, thigh, and shank.

Recessive.—A quality that recedes, applied to characters in poultry breeding.

Ribbon.—The marking across the duck's wing.

Roach-back.—Having a hump on the back like a roach.

Rose-comb.—A good broad comb, nearly level across the top and covered with small points.

Rooster.—The popular name for a male in America.

Saddle.—Part of the back reaching up to the tail of a cock, corresponding to the cushion in a hen.

Sappy.—A cream tinge on what should be a white plumage.

Scales.—The horny sheaths on the legs.

Scratching-shed.—A high open-fronted shed in which is placed the corn, scattered so that the birds must scratch for it, thus obtaining exercise.

SECONDARIES.—The quill feathers on the wing, being the second lot of stiff flight feathers from the outside of the wing. These when closed form the triangular patch of colour in a Game or other cock.

SELF COLOUR.—Meaning a bird of one uniform colour.

SERRATIONS.—Spikes on the comb.

SEX-LINKED.—Giving sex distinction at birth, *i.e.*, certain colours or characteristics are " linked " with sex.

SHAFT.—The quill or stem of a feather.

SHAFTY.—The term applied to birds where the quill of the feathers show lighter than the ground colour.

SHANK.—The scaly part of the leg.

SHEEN.—Green or any gloss on plumage.

SICKLES.—The *top* pair of curved feathers on a cock's tail, sometimes one or two pairs falling below, are so termed.

SIDE SPRIGS.—Extra spikes at the side of the comb.

SITTERS.—Varieties that incubate their eggs.

SORTING BOARD.—A board with various sized holes for grading eggs.

SPANGLING.—The effect shown by a spot or splash of colour different from ground colour; usually at the end of a feather, which is a fault.

SPIKES.—Comb serrations.

SPLIT CREST.—A crest which opens and falls to one side or the other instead of being globular.

SPUR.—Weapon of defence on the inside of the bird's shank.

SQUIRREL-TAILED.—With the tail feathers growing in such a manner that they almost reach to the neck.

STAG.—The term used by Game breeders for a young cock. Also describes a turkey cock. See also Tom.

STANDARD.—The list of requirements to constitute a perfect bird of various varieties.

STATION.—The term used for symmetry, but chiefly in connection with height and reach.

STEPPINGS.—The tops of the secondary feathers in a bird's wing, which are shorter and shorter as they draw near the back, giving the idea of steps.

STRAIN.—A special quality in a fowl which is perpetuated in its progeny.

STRIPING.—Marking in the neck and saddle hackle.

SURFACE COLOUR.—The part of the feathers exposed to sight, sometimes called top colour.

SYMMETRY.—Balance and perfection of proportion.

TAIL COVERTS.—Soft curved feathers at the sides of the lower part of the tail of the male bird.

TAIL-FEATHERS.—The stiff and straight feathers of the tail; sometimes the two top ones are slightly curved, but they are generally straight and in a cockerel are contained inside the sickles and tail coverts.

THIGHS.—The joint above the shanks; the first joint to be clothed with feathers. The drumstick in dressed fowls.

THUMB MARK.—A hollow and ridge in front of the comb on a large combed breed.

TOP COLOUR.—The surface colour of the plumage.

TOM.—A gobbler, *i.e.*, a male turkey. In some countries a "Tom" is a cockerel or male bird in all poultry except those with webbed feet.

TOP-KNOT.—The bunch of feathers on top of the head, the crest.

TRI-COLOURED.—The term given to cockerels of one shade when their shackles, saddles, and tails are darker and the wing bow darker still.

TRIO.—A cock and two hens or a cockerel and two pullets, *i.e.*, a male and two females.

UNDER COLOUR.—The fluff or part of the feathers only seen when the plumage is raised. It is of great importance in breeding and frequently differs from the surface colour.

VARIETY.—The division of a breed by colour or marking. A breed contains all the varieties of that breed.

VULTURE-HOCK.—Stiff outstanding feathers at the hock joint.

WATTLES.—The red hanging structures at each side of the bottom of the beak. Developed mostly in the male birds.

WEB.—A flat thin structure. The web of the foot is the skin in between the toes. The web of the feathers is the flat or plume part. The web of the wing is the skin seen when it is extended.

WING BAR.—Any dark line of colour or marking of the feathers known as the lower part coverts.

WING BAY.—The three cornered part of the folded wing below the bar.

WING BOW.—The shoulder part of the wing above the bar.

WING BUTTS.—The ends or corners of the wings. The upper ends being more properly the shoulder butts, the lower ends are termed the lower butts.

WING COVERTS.—The broad feathers covering the roots of secondary quills.

ZYGOTE (GREEK).—A yoke—something that joins two bodies together.

INDEX

ABDOMEN, 50, 53
Advertising, 5, 10
Ailments, 117
Air cell, 65, 139
Albumen, 29, 34, 139
Alley-ways, 20
American Breeds, 7
Anæmia, 120
Animal foods, 29
—— matter, 113
Apoplexy, 120
Appleyard Reginald, 89, 103
Appliances, 11, 24
Arks, 3, 13, 20
Artificial Brooder, 67
—— Heat, 67
—— Incubation, 56, 58
As-hatched, 88
Auto-sexing, 9, 81

BACKYARDER, 2
Bantams, 10
Barred hens, 86
Battery, 14
Battery Brooder, 66, 70
—— —— mashes, 72, 76
—— House, 14, 15
Black cocks, 86
Blastoderm, 140
Blood spots, 140
—— in droppings (See Dysentery), 126
Blount W. P., 77, 117
Blue Flint, 39
Bone Cutters, 24
—— Meal, 42
—— Measurements, 50, 52
Boxes, 26, 143
Bran, 34
Breastbone, 53
Breeding, 45
—— Line, 45
—— Pen House, 19, 21
—— Pens, 45, 47, 48, 55
Breeds, American, 7
—— Auto Sexing, 9, 81
Breeds, Barred hens, 86
—— Crosses, 9, 50, 81
—— Dark shanked cocks, 86
—— Dual purpose, 4, 6
—— Golds, 82
—— Light, 4
—— Light shanked hens, 86
—— Mediterranean, 4
—— Silvers, 82
—— Table, 4, 9
British Bantam Association, 10
Broken yolk, 64
Bronchitis, 120
Brooder, Artificial, 67
—— Battery, 66, 70
—— Electric, 69
—— Fireless, 68
—— House, 11, 17, 22
—— Indoor, 66
—— —— Interior of, 22
—— Oil, 66, 69, 96
—— Outdoor, 66, 68, 73
Brooding, 66
Broody coops, 23, 57
—— hens, 56
Bumblefoot, 120, 125
B. W. D., 59, 121
By-products, 5, 141

CABINET Incubator, 60, 62, 64
Cages, Indoor, 15
—— Laying, 14, 15
—— Outdoor, 24
Canker, 121
Capacity, 55
Capital, 5
Carbo-hydrates, 30
Catarrh, 121
Celotex, 16
Charcoal, 41
Charges, Establishment, 5
—— Fixed, 5
Chick Boxes, 143
—— Brooding, 66
—— Feeding, 72
—— Golden, 83
—— Rearing, 22, 67

Chick Rearing, Intensive, 73
—— Silver, 83
Chicken Coop, 23
Cholera, 122
Clear eggs, 65
Clover, 41
Coccidiosis, 122
Cockerel Box, 53
Cockerels, unwanted, 88
Cod liver oil, 131
Colds (See Catarrh), 121
Colony House, 18, 19
Conicotes Hologaster, 134
Consumption, 123
Cooling, 60
Coop, Broody, 23, 57
—— Chicken, 23
—— Fattening, 23
Coughing (See Gapes), 127
—— (See Pneumonia), 129
Cramming Machines, 24
Cramp, 124
Crop Binding, 124
Cross-Breeds, 9, 50, 81
Culling, 118

DARK Shanked Cocks, 86
Day-old chicks, 142
Dead-on-rail, 143
Depluming Parasites, 134
Diarrhœa (See Coccidiosis), 122
—— (See Cholera), 122
—— (See Enteritis), 126
—— (See Kidney Disorders), 127
Dietary, 30
Diphtheria, 124
Diseases, 117
Domestic Egg Production, 43
Dominant, 50, 55
Double mating, 6
Drinking water, 99, 108, 113
Droppings, 141
—— board, 11, 27
Dropsy of wattles, 130
Dry mash, 34, 35, 40, 72, 73
Dry mash hoppers, 25, 33 40
Dual purpose, 4, 9
Duck Farming, 89
Ducklings, 96
—— Rearing, 90, 96
—— Sexing, 95
Ducklings, Varieties of, 94
—— Water for, 93, 99
"*Ducks*," 89
Ducks, Farm Layout, 89, 92, 93
—— Fattening, 97
—— Feeding, 96
—— Housing, 90
Dysentery, 126

EGG Binding, 126
—— Boxes, 26
—— Carriers, 144
—— Clear, 65
—— Collecting, 42
—— Eating, 126
—— Fertility, 45, 63 65
—— Inside of, 65, 139
—— Production, 6
—— Selection, 51, 61
—— Testers, 24, 60
—— Testing, 60, 65
Eggs, for hatching, 142
—— soft shelled, 126
Eire, 9
Embryo Chick, 65
Enteritis, 126
Essex Board, 16
Establishment Charges, 5
Exhibiting, 6

FARM layout, 20, 21, 47, 89
Fats, 30
Fattening coop, 23
—— Ducks, 97
—— Geese, 108
—— Plant, 11
—— Turkeys, 115
Feather Plucking, 127
Feathers, 141
Feeding Chicks, 72
—— dry mash, 40
—— Geese, 106
—— Intensive, 42
—— Mixtures, 41
—— Principles, 29
—— Semi-intensive, 72, 75
—— time-tables, 41
—— Turkeys, 110
Femurs, 119
Fencing, 28

Fertilisation of land, 3
Fertility, Testing for, 63, 65
Fibre, 30
Fish Meal, 34, 41
Fireless Brooder, 68
Fleas, 132
Fold, 3, 12, 13
Food, 29
—— mineral mixture, 75
—— Room, 11
—— Stores, 20, 31
—— Tables, 34, 37, 38
—— Troughs, 24
—— Weight of, 41
Foot-swelling (See Bumblefoot), 120, 125
Foster Mother, 69, 92
Fowl Paralysis, 125
—— Pox, 121
—— Tick, 134
Frost Bite, 127

GAPES, 127
Garden Egg Production, 43
—— Poultry House, 23
Geese, 103
—— Characteristics, 103
—— Fattening, 108
—— Feeding, 106
—— Varieties of, 103
—— Weights of, 103
Germinal Spot, 65, 140
Gizzard, 39, 119, 133
Golden Chick, 83
Gold breeds, 81-83
Goslings, 105
Grading eggs, 62
Grain, 33, 41
Grass, 108
Green food, 44, 73, 110, 112
Grit, 39, 74, 100, 108
—— container, 43

Ground Oats, 34
Growths (See Canker), 121
—— (See Diphtheria), 124

HALNAN, Professor, 35, 36
Handling, 50
Hatching eggs, 140, 142
Heating, 17, 18
Hen flea, 132
Hocks, 53
"Hoganism," 50
Hoppers, 25, 33, 40
House, Battery, 14, 15
—— Breeding, 19, 21
—— Brooder, 17, 22
—— Colony, 18, 19
—— Fold, 3, 12, 13
—— Garden, 23
—— Incubator, 16, 17, 20
—— Intensive, inside of, 21
—— Laying, 12, 21
—— Night Ark, 20
—— Scratching, 18
—— Semi-intensive, 21
—— Six-by-four, 18, 96
—— Stubble, 13
Housing, 11
—— Ducks, 90
—— Turkeys, 111
Hovers, 17, 69, 73
Humidity, 56, 64, 100

INCUBATION, Artificial, 56, 58
—— cooling, 60
—— Failures, 61
—— Moisture, 63
—— Natural, 56
—— Temperature, 16, 59
Incubator Cabinets, 62
—— House, 16, 17, 20
—— Mammoth, 64
—— Room, 11, 16
Incubators, 58
Intensive Feeding, 42
—— House, 21
—— Rearing—chicks, 73
—— —— —turkeys, 111
Intestines, 133
Isolation, 118

JAPANESE sexing, 77
Joint Disease, 127

KIDNEY Disease, 127
Kidney Troubles, 32

LAMPS, attention to, 70
Lancashire, 9
Land, 8, 11
—— tainted, 89
Laying cages, 14, 15
—— house, 12, 21
Layout, 20, 21, 47
Leg band, 49
Leguminous seeds, 29
Leg Weakness, 128
Light Breeds, 4
Light Shanked hens, 86
Limestone, 39
Line Breeding, 45
Liperarus Variabilis, 134
Liver, 133
—— Disease, 127
Long Hundred, 144
Loss of Weight (See Coccidiosis), 122
—— (See Consumption), 123
Louse, Red, 134
Lymphomatosis, 128

MAIZE Meal, 34
Mammoth Incubator, 64
Manure, 141
Mashes, 34-40, 72-76
Mating, 45, 48, 81
Meal, Fish, 34, 41
—— Meat, 41
Mediterranean, 4
Membrane, 139
Mendelism, 49
Menopon Pallidum, 134
Mineral Matter, 30, 74
—— Mixture, 75
Miniature Fowl, 10
Mixing, 40
Moisture, 56, 63, 64, 100
Moping (See Cholera), 122
—— (See Egg binding), 126
Mouth growths (See Canker), 121

NATIONAL Poultry Institute, 35
Natural Incubation, 56
Nest, 56
Nest Boxes, 11, 13
Netting, 28, 47, 90
Nicotine Sulphate, 132
Night Ark, 3, 20
Northern Ireland, 9
North of England, 8

OATS, ground, 34
Occipital spot, 84
Oil, 32
Oil Brooder, 66, 69, 96
Outdoor Brooder, 68, 73
—— Cages, 24
—— Rearer, 68, 73
Ovary, 133
Oyster shell, 39

PARALYSIS, 125, 128
Parasites, 132
Pease, Michael, 87
Pedigree Egg Selection, 51
Pelvic Bones, 50, 52, 53, 54, 55
Perches, 11, 27, 115
Perchloride of Mercury, 59
Phrenology, 54
Pip, 129
Pneumonia, 129
Pop-holes, 19
Post-mortems, 118, 133
Poultry Advertisement Control Board, 88
"*Poultry Ailments*," 117, 119
Poultry Club Standards, 140
Poultry Club, The, 140
"*Poultry World*," 52
Powell-Owen, W. Mr., 52
Prepotency, 54
Prize Money, 6
Protein, 29
Punnett, Professor, 81
Purple Comb (See Liver Disease), 127

QUILL Binding, 129

RAINWATER, 39
Range rearing, 114
Ration, typical, 34
Rats, 12, 26

Rearer, 68, 73
Rearing, 67
Rearing chicks, 27, 67
—— ducklings, 90, 96
Rearing, intensive—chicks, 73
—— —— —turkeys, 111
—— for exhibition, 72
—— —— laying, 72
—— —— table, 72
—— turkeys, 110, 116
Recessive, 50
Recipes, dry mash, 40
Recording, 71
Red mite, 132
Rent, 5
Replacements, 143, 144
Ring. 49
Roof lights, 19
Roosting, 13
Roup, 130
Runs, 20, 47

SALTS, 30, 39, 41
Scaly Legs, 57, 130
Scratching sheds, 18
Selecting Eggs, 51, 61
Selection, Breeding for, 46
Semi-intensive feeding, 72, 75
—— —— house, 21
Sexing Day-old Chicks, 77
"*Sexing Day-old Chicks*," 77
Sexing Ducks, 95
Sex-Linkage, 4, 9, 10, 55, 81
Shanks 53
Shows, 6
Sidelines, 5, 141
Silver Chick, 83
Silvers, 81-83
Sitting Boxes, 25, 56
Sittings, despatch of, 144
Six-by-four, 18, 96
Soft shells, 126
Soil, in relation to breed, 8
Southern England, 8
Specialise, 5, 6
"Sport," 6, 7, 46
Standard Bread, 2
—— Breeding, 5
Standards, 140
Starch, 33
Stubble-house, 13
Sunlight, 22
Sun parlour, 22

TABLE Breeds, 4, 9
Tainted land, 89
Tar, 25, 28
Temperatures, incubation, 16, 59, 100
—— rearing, 71
Testing Eggs, 63
Thermometer, use of, 58, 61
Thigh Bone, 119
Time table feeding, 41
Tincture of Perchloride of iron, 140
Toe Punching, 49
Trap nests, 21, 24, 49
Travelling Boxes, 143
Troughs, 24, 99
Trussing Ducks, 138
—— Fowls, 135
—— Geese, 138
—— Room, 11
—— Turkeys, 138
Tuberculosis, 130
Turkeys, 109
—— fattening, 115
—— feeding, 110
—— housing, 111
—— intensive rearing, 111
—— rearing, 110, 116

ULTRA-violet rays, 22
Utility, 2, 5

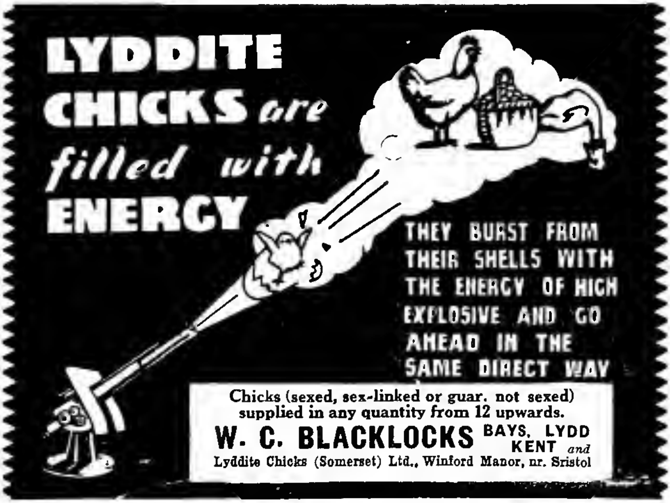
VENT, 53, 77
Vent Gleet, 130
Ventilating aids, 27
Ventilation, 16
Vertigo, 130

WASTING (See Consumption), 123
Water, 39, 72, 74, 99, 108
Water supply, 11, 16, 28, 32
Water vessels, 24, 99
Wattles, dropsy, 130
Weatings, 34

Weights of food, 41
Wet mash, 36, 72
Wheezing (See Bronchitis), 120
White Comb, 130
—— Diarrhœa, 130
—— Legged, 9
—— of egg, 29, 139
Wind Breaks, 19, 47
Wire netting, 28, 47
Worms, 131

X-RAY hen, 119

YELLOW-legged, 8
Yolk, 139
—— broken, 64
Yorkshire, 9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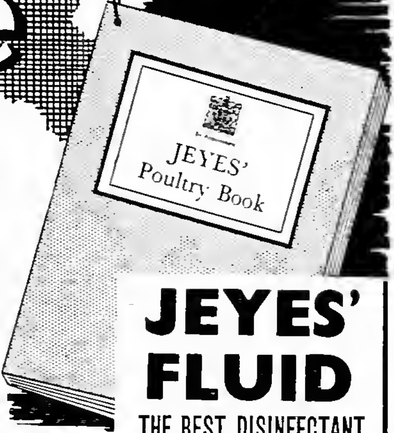

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